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**THE
GOLDEN HEALTH
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Edited by
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A Complete Guide to Golden Health for Men & Women of all Ages
Written by over 100 of the World's Leading Specialists •
with contributions from

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VOLUME ONE

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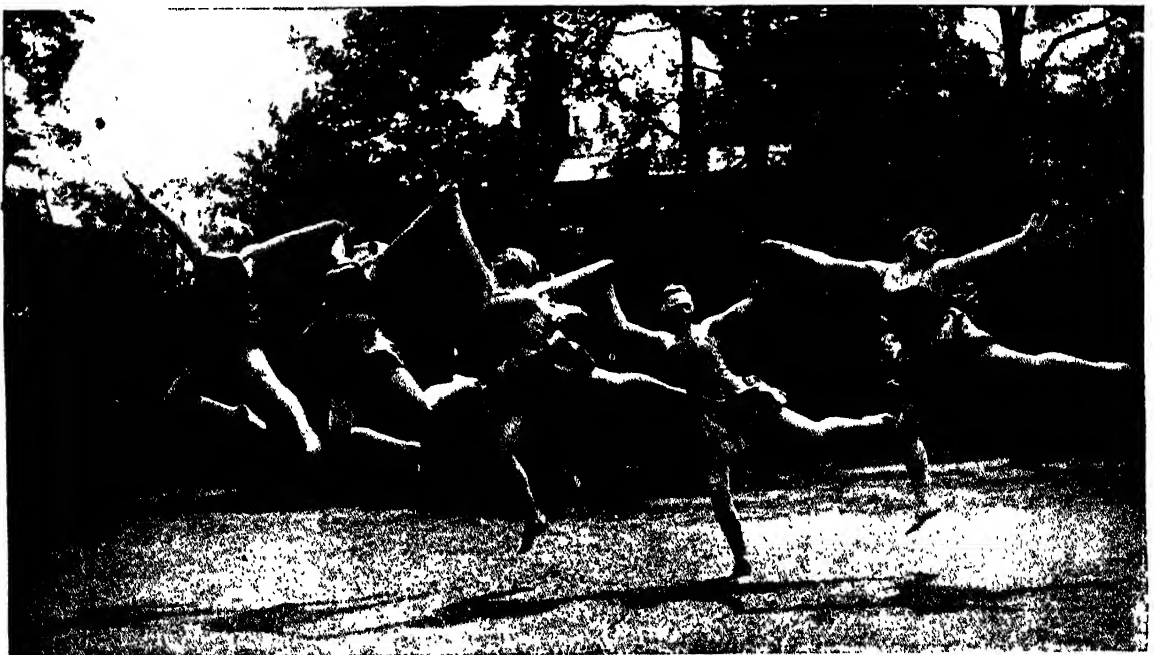
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[Daily Chronicle]

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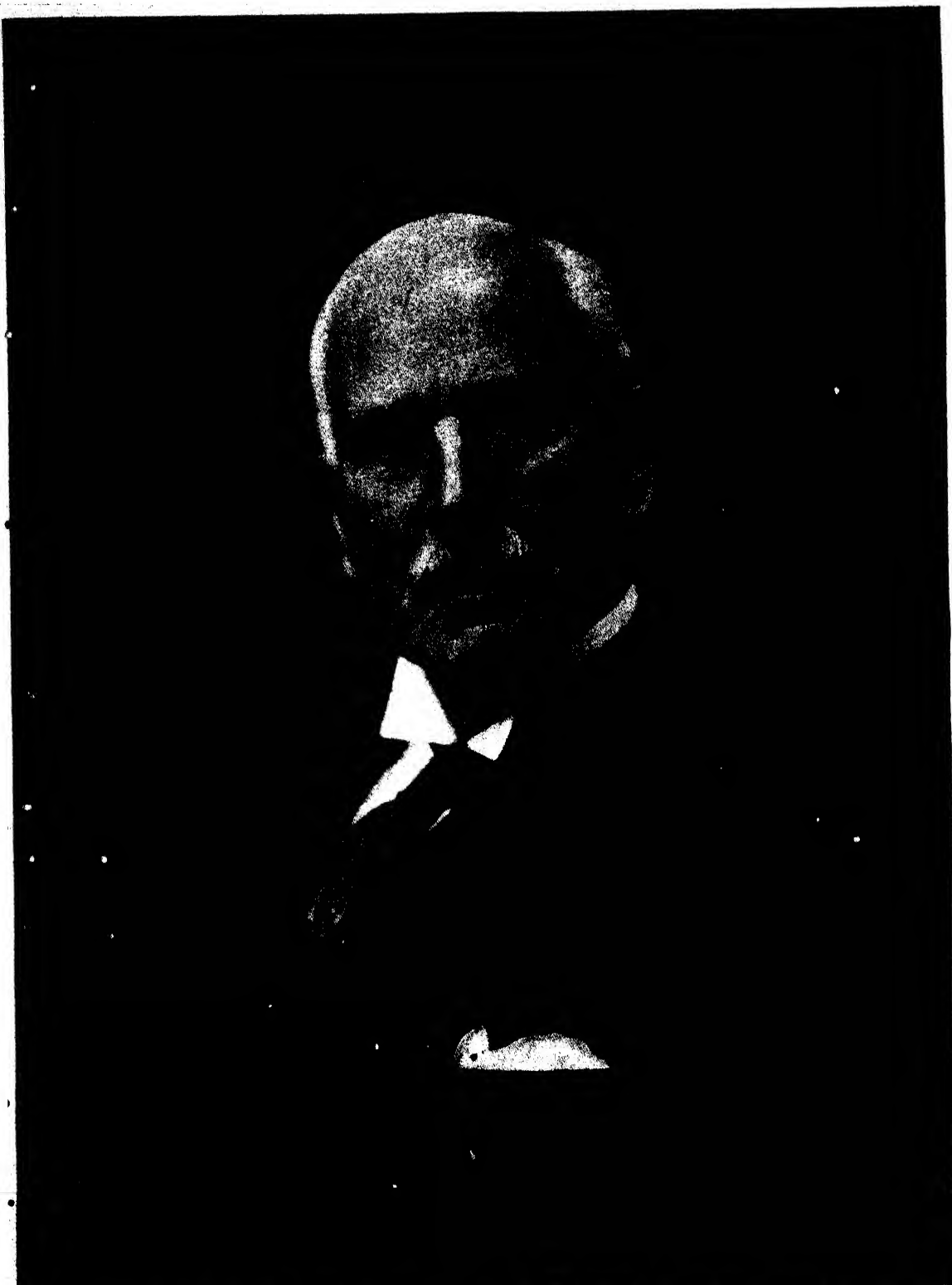
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SIR W. ARBUTHNOT LANE, BART., C.B., M.S., F.R.C.S.
The famous President of the New Health Society; Consulting Surgeon to Guy's Hospital, to the
Great Ormond Street Hospital for Children, and to the Shaftesbury Avenue French Hospital.



THE RT. HON. T. P. O'CONNOR, P.C., M.P., the "Father of the House of Commons." Writes the article "Health, Wealth, and Youth."



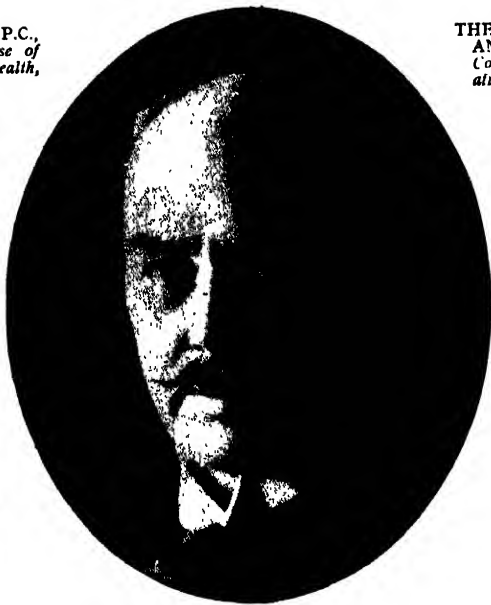
PROFESSOR J. W. SCOTT, M.A., D.Phil., Professor of Philosophy, University of Cardiff. Writes on Homecrafting and Home Hygiene.



THE MARCHIONESS OF ABERDEEN AND TEMAIR, President, International Council of Women. Describes the Organisation of Public Health Services.



THE LADY ASKWITH, D.B.E., the prominent worker in the cause of Eugenics. Discusses Problems of Eugenics.



SIR RONALD ROSS, K.C.B., C.B., K.C.M.G., F.R.S., LL.D., D.Sc., M.D., D.P.H., F.R.C.S., etc., Director-in-Chief, Ross Institute and Hospital for Tropical Diseases. Writes on "The World War against Disease."



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G.B.E., C.R., M.V.O., LL.D., Chairman
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tributes the "Foreword."



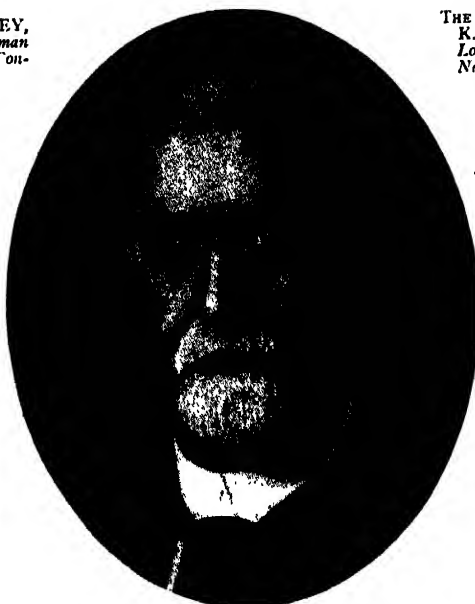
MARIA MONTESSORI, M.D., D.Litt.,
Director, Montessori Research Institute,
Barcelona. Discusses the
relations between the Adult and the Child.



THE RT. HON. LORD BUCKMASTER,
K.C., P.C., the Eminent Jurist and ex-
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Nation and Health."



D. D. COTTINGTON-TAYLOR, Director
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MARGARET MORRIS, the famous
Exponent of Rhythmic Exercise, writes on
"Posture and Health."



THE VISCOUNTESS ERLEIGH, the
Patroness of Baby Welfare. Writes on
the Health of the Baby and the Child's
Place in the Home



STELLA CHURCHILL, M.R.C.S.,
L.R.C.P., D.P.H., Medical Officer, West
Hackney Welfare Clinic. Describes the
"Ailments of Childhood."



PERCY HALL, M.R.C.S., L.R.C.P.,
Hon. Actino-Therapist, Mount Vernon
Hospital. Describes "The Sunlight
Cure" and "X-ray."

A GALLERY OF CONTRIBUTORS



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MABEL LIDDIARD, *Matron, Mothercraft Training Society. Contributes a series of articles on the Care of the Baby.*



PROFESSOR E. C. C. BALY, C.B.E., M.Sc., F.R.S., *Grant Professor of Inorganic Chemistry, University of Liverpool. Discusses the Influence of the Sun and Moon on Life.*



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FOREWORD

by the

Chairman of the British Red Cross Society

The Hon. Sir ARTHUR STANLEY

G.B.E., C.B., M.V.O., LL.D.

NOTHING could be more significant of the modern spirit than the zeal with which every great organisation devoted to the healing of human ills pursues the methods of prevention. Every great hospital does its utmost, after endeavouring to cure the individual sufferer, to show him or her how to avoid a recurrence of the complaint.

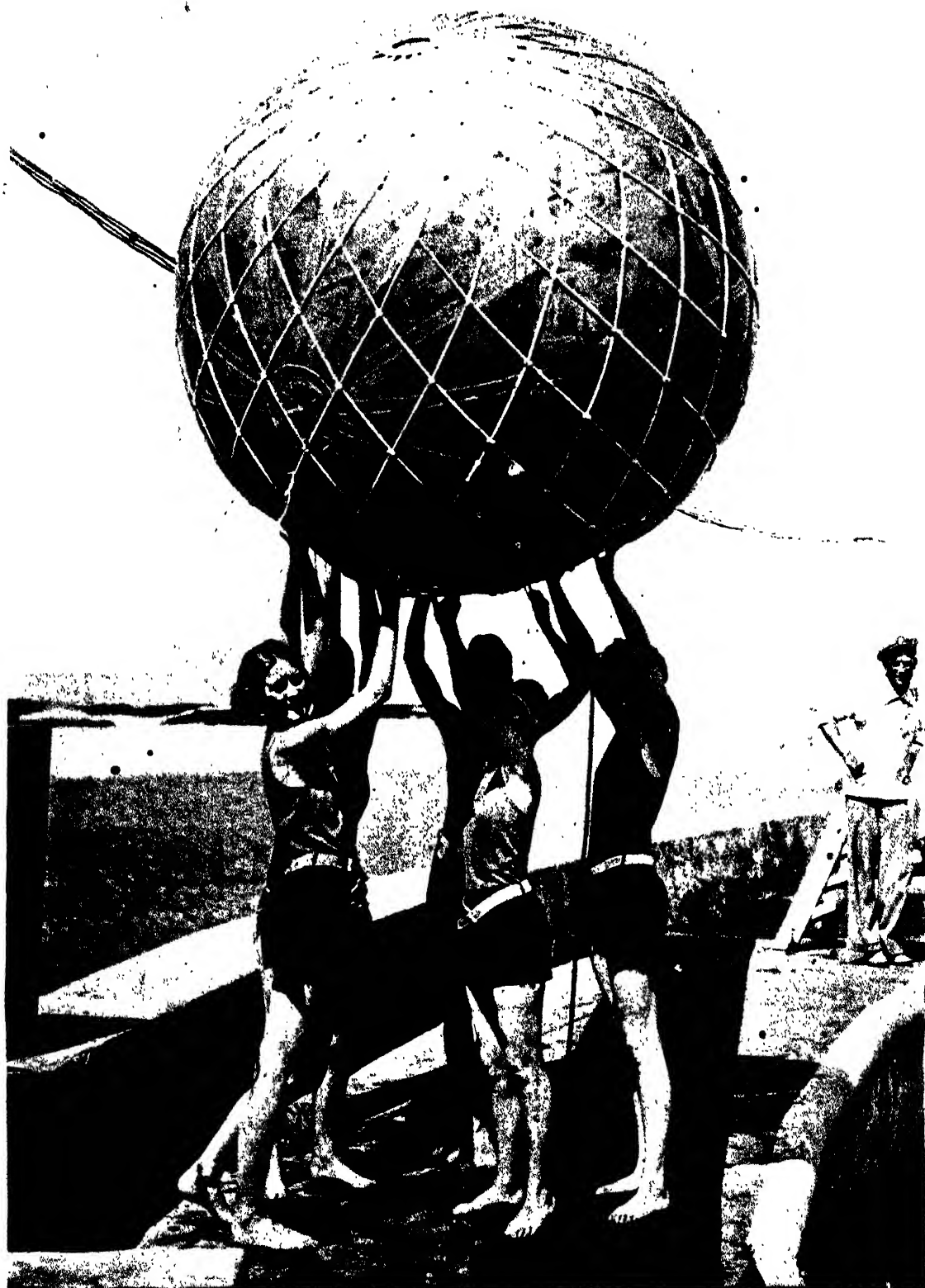
The amount of preventive work that can be undertaken in regard to all the chief causes of mortality in this country is incalculable, and abundant proof is now forthcoming of the efficacy of educating the public in this direction.

The Ministry of Health, Medical Officers of Health, Local Health Authorities, The British Red Cross Society, and many voluntary societies are constantly engaged in disseminating information to the public, designed to protect them from infections and disorders of every kind. The promoters of the Golden Health Library, knowing that the demand for information, as well as the need for it, has become universal, have planned this great work to give to every type of individual in the community the priceless knowledge essential to the maintenance of his health.

The work therefore covers, in popular language, the whole field of medicine and its related sciences. The conditions of the body and mind in health and disease are fully dealt with by medical and scientific experts in their various fields. Commencing at the very origins of life, the biological foundations of health are described, together with such details of the anatomy, physiology, and pathology of the human organism as are necessary to our understanding of the basic conditions of health. Enough is said of the diseases to which flesh is heir to indicate their causes, their elementary treatment, and preventive measures. Such subjects as nutrition, exercise, clothing, first aid in emergencies, occupational diseases, sunlight, fresh air, the hygiene of the home, and maternity and child welfare are admirably covered in the Golden Health Library.

We have definitely entered upon the period of civilisation in which health education has become the most vital and important of our social activities. We have at our service thousands of able and willing workers who desire only the opportunity to place their knowledge and skill at the disposal of all who may require it. This valuable compendium is a unique effort in this direction.

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SUNSHINE AND EXERCISE—FOUNDATIONS OF HEALTH

[Keystone]

THE FOUNDATIONS OF HEALTH

THE SCOPE AND AIMS OF A MONUMENTAL WORK

By Sir W. ARBUTHNOT LANE, Bart., C.B., M.S., F.R.C.S., President, New Health Society;
Consulting Surgeon to Guy's Hospital, and to the Great Ormond Street Hospital for Children. •

EVERY man and woman in the community is deeply interested in health. It has a personal and individual appeal that nothing can rival. With good health everything is possible; without it, life is but a misery. The true aim of medical science is to teach people—in the original meaning of the Latin word “doctor”—how to keep well. In the words of the “Father of Medicine,” the great Hippocrates, written over 2000 years ago :

“Whoever pays no attention to these things, or who pays attention to them without full knowledge, cannot understand the diseases which befall man. By every one of these factors the health and condition of man are affected in some way, and his entire life is influenced thereby, whether he be in health, suffering from disease, or convalescent. It follows that nothing else is more important or more necessary to know than these things.”

• It is surely the great object of a progressive civilisation to make the most of what mankind has gathered of the wisdom of experience, in its age-long march, and also of the latest discoveries of modern science. The *Golden Health Library* seeks to achieve this essential combination, by offering its readers all that man's past can teach them, together with the best scientific knowledge gained during the last hundred years.

The underlying conception of this work is that good health can be attained and preserved by ascertained principles of living. It is not a close secret of the medical profession, nor is it to be found in specifics and prescriptions. Modern civilisation is obsessed by the disease complex, and medicine, which is dominated at least as much as other professions by the state of public

opinion, is still unable to think itself away from that false and injurious attitude towards its function. The physician as “healer” still carries the strongest popular appeal. Yet it cannot be denied that it is the physician as “preventer of ills” who will be the doctor of the future. *Preventive medicine will be the supreme human science of this century.*

It is from this point of view that the *Golden Health Library* has been planned and written, with the aid of the skill and knowledge of a large number of medical and scientific experts of the highest eminence.

It is not, however, for one moment suggested that we can ignore disease and preach only its prevention. We live in a very imperfect world, under social conditions and prevailing personal habits that render disease inevitable. The scope of this work must therefore comprehend existing ills that cry out for relief, as well as point the way to their prevention for the benefit of later generations.

There is no intention of supplanting the medical man or of “making every man his own doctor.” The study and practice of medicine must ever remain one of the high specialisms of human knowledge and application. The broad aim of the work is rather to enable every man and woman to know himself and herself in the best sense—to know how the human machine has evolved, how it works, the ideal conditions for its efficient running, the causes of its inefficiency and ultimate breakdown, and the best measures for its repair and restoration.

We may now usefully sum up the scope and aims of the *Golden Health Library*.

1. We must first understand how we came to be—the evolution and nature of the

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human organism, the factors that make us similar to and different from the lower animals, the reasons, in short, for all the physical and mental complexities of mankind, so far as they relate to health and its maintenance.

2. It is equally essential to know how our bodies are formed—our anatomy and physiology. Every child should be taught the simple principles of its bony structure, its muscular system, its respiratory system, and all the other functioning parts of its physical being, for only with the possession of such knowledge can it lay the foundations of permanent health.

3. The life of each of us passes through more or less well-defined phases—infancy, adolescence, middle age, old age, with intermediate stages of varying definition. These are fully dealt with in the work. The general nature of disease, early symptoms, common ailments, various forms of disorder and degeneration are fully described.

"The Environment of Health" is the subject of a most important series of articles. The principles of nutrition—food, water, air, sunlight—are very fully described. The relation of diet to physical fitness and efficiency forms one of the most important sections. Public Health and Preventive Medicine constitute another valuable section,

while "Health in Industry" includes full descriptions of occupational diseases, their causes, treatments, and prevention. Detailed instructions are given on the rendering of First-Aid in Emergencies.

5. "The Health and Hygiene of the Home" is a subject whose significance cannot be exaggerated, in an age when science and common sense are allied to save the housewife all unnecessary toil.

The welfare of Child and Mother is dealt with by specialists, who traverse the whole subject from Ante-natal Care to "The Older Child," completing the series by articles on the adolescents of both sexes.

The vexed question of "Birth Control" is discussed by a famous exponent, while the Home and Family section concludes with "The Case of the Invalid" and a most useful article on "The Home Medicine Chest," by a pharmaceutical expert.

6. Last, but not least, is the section on "The Mind in Health and Disease." The origin and development of the human mind are described, every kind of mental faculty and manifestation explained, and each of the numerous mental disorders analysed.

Finally, the comprehensive index simplifies reference and completes the work as a safe guide and mentor in the everyday illness and emergencies of home and business life.



THE DANCE OF THE GLADIATORS

Grace and perfect physical development are typified in these sculptured figures from the Vatican Museum, Rome.

THE FOUNDATIONS OF HEALTH



[Photopress]

THE WAY TO PERSONAL HEALTH

*From the CHIEF MEDICAL OFFICER'S ANNUAL REPORT, 1926, on the STATE OF THE PUBLIC HEALTH * (reproduced by permission of the Controller of H.M. Stationery Office).*

I SUPPOSE it is correct to say that never before in the history of this country has so much been attempted by the State on behalf of the health of the people as now. Yet the State cannot alone secure the results desired. There can be no public health apart from individual health, which cannot be conferred or imposed by the State. It must be a matter of individual achievement, though the individual may be helped and taught by the State. In the present time much is said, and well and rightly said, in the public press and elsewhere in the form of advice as to the acquisition or maintenance of personal health. I have no doubt that the very wide dissemination of health information in England and America is doing immeasurable good. That the material or "news" thus provided is imperfect or unequal, inclined to be propagandist rather than educational in presentation, and sometimes unbalanced and ill informed, does not mean that as a whole it is unbeneficial. For, after all, this is the way in which knowledge—always growing and expanding—filters down from the discoverers to the mass of the people and becomes applied. Yet it is important that year by year we should seek

to make such transmission more accurate in fact, and in its application more in accord with the best kind of human experience. On the whole, it would appear that one undesirable characteristic of this modern mode of dissemination is some lack of a sense of proportion. The things which we are advised to do in respect of clothing, dietary, and habits are so numerous and varied that we incur some risk of not knowing what course to adopt, what to accept and what to decline, and consequently of doing nothing.

It is, I think, important to remember that personal health is not an accomplishment but a growth, a growth which depends upon the nature of the individual, his constitution, and its sound nurture. Nature and nurture lie at the foundation of all true growth and all true health, and they are mutually inter-related. It is true we cannot select our parents, nor can we change essentially our germ plasm or the character and formation of our bodies. That is our inheritance and we must accept it for better or worse. We can, however, study to know and understand capacities and tendencies,

The
Eugenic
Basis.

* pp. 265-268.

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and this is the first step to personal health. Moreover, we may be able to ensure that those who follow us will have better stock or constitution than we enjoy. Sound mating is the beginning of good breeding, and the offspring of healthy marriages inherit a strong constitution or nature. Unwise mating is a source of enfeebled health, of unstable disposition or even of disease. We must also remember that it is possible that individual immunity and the chemical constitution of the body may be transmitted from parent to child. The latent forces of heredity are but little regarded, yet they have probably more to do with personal and racial health than any other factor. It is idle to ignore them. It is still more futile to neglect the proper nurture of the body.

In order to obtain the advantages of wise nurture, it is necessary to view it as a whole. First, the body itself calls for attention and study; and secondly, the means of keeping it in health, its nurture, must be practised and not only professed. The body is not merely a machine, it is a growing organism, with its own individual tendencies, idiosyncrasies, and susceptibilities, each of them having an ancestral history. Its growth is not equally regular, and its nutrition must have regard to this fact. There is special growth between one and two years of age and again at puberty. In this country girls grow more rapidly than boys between 10-15 years, the year of greatest growth being generally the thirteenth: whereas in boys it is usually the sixteenth. Actual growth in size terminates between the 20th and 26th years. A boy between 9 and 16 years of age requires as much food as a full grown man, and between 16 and 19 he will require more. In a word, age, sex, and circumstance should govern the methods of personal health.

Take dietary as an example. The purpose of food is fourfold. It furnishes fuel for energy; it creates and sustains growth; it provides for repair; and it is necessary to reproduction.

Therefore, its constituent elements must be modified; ample protein is

absolutely necessary to children for growth and development, whereas an adult worker can obtain energy from carbohydrate and fatty food, and requires less protein than the child. Uncooked vegetables, uncooked fruit and dairy produce are more valuable than artificial and prepared foods or excess of meat. The net value of food is not the total amount or kind taken into the alimentary canal, but the proportion digested and absorbed, which is the proportion of vital use to the body. And food is not the only requisite for nutrition. Abundance of fresh air, moderate and regular exercise, warmth and rest are also necessary. It is excessive and unsuitable food combined with lack of fresh air and exercise which sows the seeds of degeneration. The health of the body is dependent upon the adaptation and inter-relationship of the five conditions named. It is a fallacy to suppose that immoderate attention to any one of them and disregard to the others will produce health. Health is a harmony of all, and it is the only harmony which makes the resistant body. The Greeks taught that self-knowledge, moderation, and simplicity were the cardinal virtues of good living, and they were right. True nurture calls also for a particular kind of hygiene of the muscular, respiratory, alimentary, and nervous systems of the body. Each must be kept in good condition and fit to perform its function.

Thus the basic fact of health is not this or that remedy or panacea, but the daily practice of the physiology of the body not only that it may effectually perform its daily work, but that it may be able to withstand the strains and infections to which inevitably it will be subjected. This leads me to say that the second outstanding principle of health is the avoidance of the causes of impairment and disease. Briefly, the occasions of disease are infection, uncleanness, excessive fatigue, irritation, and injury; these are the factors which require vigilance. The respiratory tract is probably the principal channel for receiving and transmitting infection. The cough spray is one of the

Healthy
Living.

The
Importance
of Diet.

THE FOUNDATIONS OF HEALTH

most fertile, active, and universal of all modes of conveying infection. Sneezing, coughing, loud speaking, mouth breathing, expectoration—these are among the commonest ways of spreading the germs of disease, and overcrowding of persons provides the favourable opportunity. Tuberculosis, infectious pneumonia, tonsillitis, nearly all the common infectious diseases and many of the epidemic nervous diseases are thus conveyed. Shun an infected person's breath, avoid forceful expiration in other people's faces, and do not spit—such peremptory exhortations constitute a regimen of prevention which would banish much disease.

Cleanliness is scarcely less important. A clean body, within and without, is almost an assurance of health. Clean teeth and mouth, a clean lung and a cleansed alimentary canal are guarantee against much infection. The reduction of continuous or frequent fatigue and irritation would also lead to diminution of sickness—a reduction obtainable in fair measure by proper regard to the necessity of periodical rest. Rest is a great healer. Constant strain, noise, or worry tends to unbalance the nervous system, as intermittent irritation the healthy growth of the body tissues. All this is common knowledge, and if and when it becomes

common practice individual health will increase. We may turn almost where we will for examples of these agencies of ill health. A predisposition to cancer may follow the intermittent irritation of a jagged tooth, the persistent irritation of the breast, skin, lips, tongue, or throat, the slow poisoning or tissue reaction of alimentary trouble, the frequent over-stimulation

of the walls of the stomach? The germ of tuberculosis is conveyable by dried sputum or cough spray, and it may find a favourable nidus in an immobile or unventilated lung or an inflamed respiratory tract. Indigestion may originate in excessive or unsuitable food, the unwise consumption of alcohol, or a stagnant alimentary canal. In all these cases there are, of course, other factors at work; but mortal disease is initiated by simple beginnings, is facilitated by the disregard of homely rules, and is strangely



THE DISC THROWER

The Greeks attained their splendid physical development by devotion to the fundamental principles of right living.

responsive to individual susceptibilities. Further, there is an axiom to which there is no exception. It is this: the best attack is early treatment.

Thus the path to personal health is: first, a sound body at birth and its careful nurture in life—a matter of stock, heredity, and culture; secondly, the avoidance of the causes of impairment and disease—the

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HURRAH FOR A DAY IN THE OPEN!

(Topick)

School children revelling in the summer sunshine.

daily conflict between man's body and its total environment ; and thirdly, the prompt and early treatment of deficiencies as they occur.

We have in England to-day such opportunity as we have never had before to conquer preventable disease, and ensure personal health and increased capacity. It is true that with respect to many subjects our ignorance is still great and that there is urgent need of research, wisely planned and deliberately carried out. But those who urge us to promote research into this or that topic too often forget that fruitful research is an adjustment of means to ends, making high demands upon the sense of proportion ; that ignorance and curiosity are far from being sufficient grounds for embarking upon an investigation ; and that the effect of certain materials or conditions upon individual men or upon the lower animals

does not mean that like results will follow upon mankind as a whole. The science and art of Preventive Medicine is extending in almost all directions ; knowledge of it is becoming more applicable and effective ; and public opinion is supporting the cultivation of health and fitness in the individual. There is more willingness to live in the open air and take recreative exercise ; more sensible views prevail as to food and clothing ; sobriety is increasing ; industry is safeguarded from many of its former dangers ; the housing of the people is steadily improving ; and, most effective of all, the value of education is being more generally appreciated. These changes indicate an immense awakening and a wider use of the improved environment and health facilities provided by the State. Much disease and impairment remains, but evidence suggests that we are on the high road to their amelioration.

THE FOUNDATIONS OF HEALTH

THE PRIMARY LAWS OF HEALTH

By Sir BRUCE BRUCE-PORTER, K.B.E., C.M.G., M.D., late Physician to King Edward VII.'s Hospital.

IN health it is the simple things which matter, in fact the A.B.C. Knowledge in itself is not enough: we have abundant evidence of this in the history of medicine, for some of its most distinguished members, by ignoring the law which says "six days shalt thou labour," and so working to the neglect of the demand of the body and brain, have died in early years, worn out and old men.

The laws of the community are often broken with impunity, and the offenders have escaped, but the breaking of the laws of health is followed sooner or later by punishment, which may vary from a slight ache or pain to a shortening of life.

• There is in the service a rule which runs: "Ignorance of published orders is no excuse." And with the body the same rule applies.

It is surprising to a degree how small an amount the average man and woman knows of the structure or needs of the body.

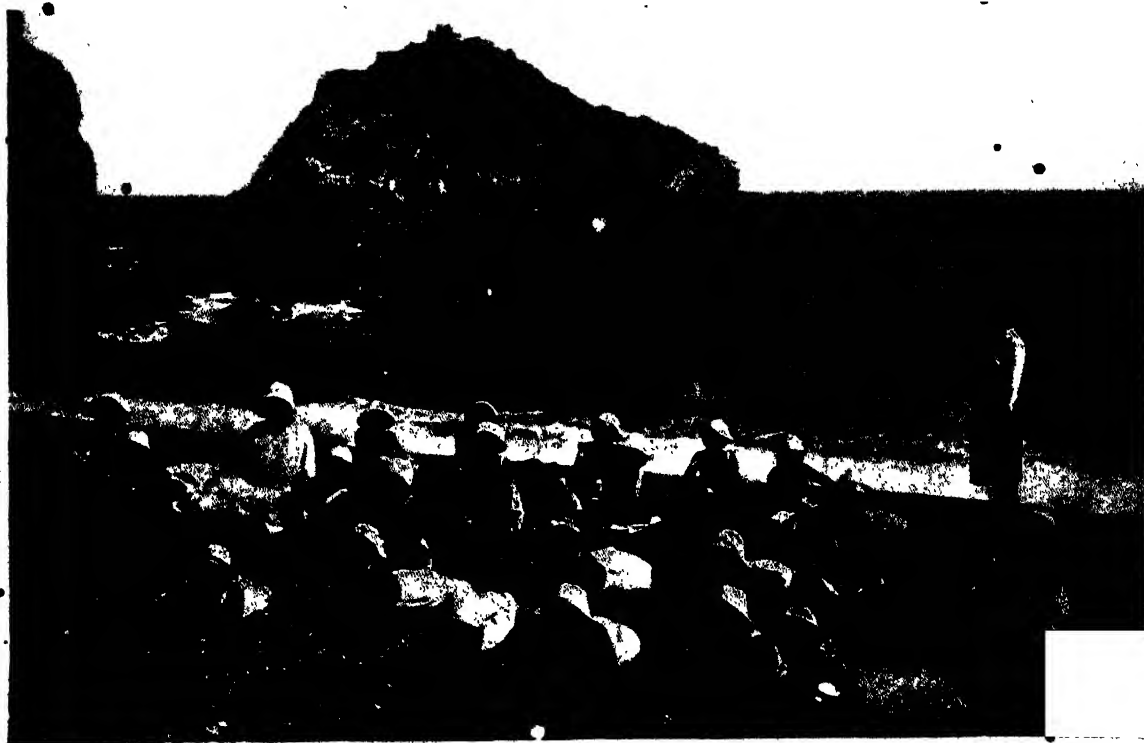
I frequently use the illustration of the

body as a city, having the same essential needs, *i.e.*, fresh air, fresh water, fresh food, and a good drainage system. I have placed them in this order, as air is the most important. We cannot live without air for even a few minutes, and without water for more than a few days.

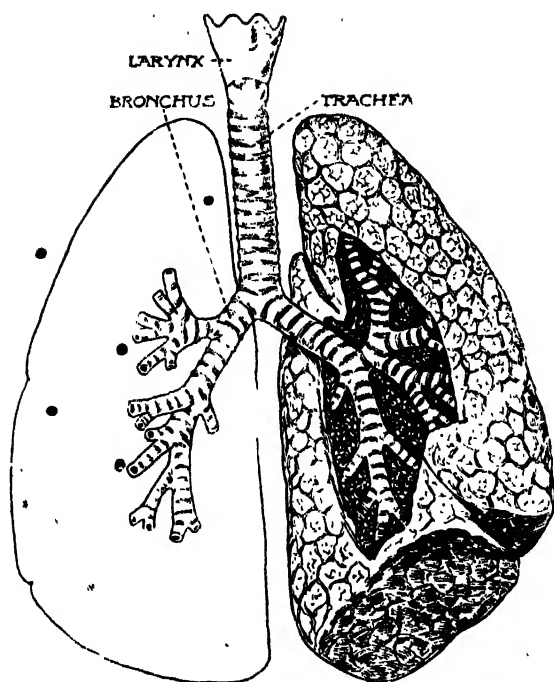
In considering air, we must first think of it as in the atmosphere over the town where, polluted, it hangs like a pall above our dwellings, cutting out the great curative agent, "sunlight, without which life cannot exist. Air is so essential that we must have a constant supply. The air in the room occupied by human beings must be changed frequently, and one of the problems of the architect is so to construct his buildings that the air shall be changed without causing a draught.

Windows on opposite sides of a room are best, but very few houses in town have this arrangement. Next best is the window and

Fresh
Air.



NATURE'S WAY TO HEALTH



THE STRUCTURE OF THE LUNGS

The windpipe or trachea divides into two branches (the bronchi), which continue to sub-divide until each minute tube ends in a little bladder.

fireplace. In many modern buildings the fireplace is non-existent, the heating being by hot-water pipes and central heating—very convenient, but making the changing of air more difficult.

Forced ventilation is in use in many big buildings, and in some the air is washed before being pumped into the rooms, but for the average person we are concerned with the ordinary house. Where a fireplace exists, the chimney should never be closed, and portions of the windows should be open day and night. The ventilation of the workshop or factory is seen to by factory inspectors, but the workers must be educated to realise the importance of the open windows.

In days gone by, when a patient felt ill with any lung condition, the first thing done was to close the windows to keep out the draught. How many poor invalids were helped over the border by this is beyond count. I remember over thirty years ago one of my medical teachers saying : "If you find broncho-pneumonia in a patient, it is due to bad air."

We now treat our pneumonias with open windows, and in hospitals the pneumonia case is moved to the window—the steam kettle and tent which killed many a child has given place to the open window. So much for the air in the house ; the most important thing of all is to get it into the lungs.

Most people have very sketchy ideas as to what the function of the lungs is. They talk at times about a spot on the lungs much as if it meant a rash. The structure of the lungs is after this fashion. The windpipe or trachea divides into two branches, one for each lung, and the sub-division goes on until the final divisions are about one-fiftieth of an inch in diameter, and end in a little bladder with indentations in its sides.

Corresponding to the division of the air passages has been the dividing up of the artery which brings the blood for purification at the terminal divisions. Only a layer of cells separates the blood from the air, and through these cells the interchange takes place, the blood giving off waste matter and taking in oxygen. The oxygen combines with the iron in the blood and is ready for circulation in the tissues. It converts the dark venous blood which has been brought to the lungs by the pulmonary artery into bright arterial blood, which is collected by the veins in the lung and taken back to the heart. This is a reversal of the usual process, as in the lungs the artery carries venous blood.

In estimating the waste material given off by the lungs, we use the carbonic acid gas as our indicator, but it is a mistake to think that this gas is the real danger in the air of a room in which people are congregated. The dangerous matters are other things which we cannot analyse, and the lack of oxygen. It has been proved by experiments that the amount of carbonic acid gas which may be present in a room, providing it is put into a pure state, is many times more than found in air which has become dangerous by human usage.

We have all experienced at times the hard, heavy feeling after attendance at a crowded meeting in a badly-ventilated room.

THE FOUNDATIONS OF HEALTH

Now, in health, the rate of breathing is seventeen times a minute, and during the minute the pulse beats about seventy-two times, and at each beat sends, in the adult, about two ounces of impure venous blood into the lungs while extracting a similar quantity of purified blood. A simple calculation shows that some seven pints of blood are passed through the lungs every minute, or the whole blood goes this journey in two minutes.

• It is essential that if the interchange is to take place properly full use must be made of the chest expansion, otherwise the whole of the waste is not given off, nor is the proper amount of oxygen taken up. The whole nutritive function of the body suffers as a result. The food necessary for the heat and energy production without a proper quantity of oxygen cannot be burned up, and a common cause of ill health is the faulty use of the lungs.

In children, neglect to keep the airways clear leads to innumerable troubles. The nose is meant by Nature to be the channel through which the air enters the lungs. When, through want of training, the child breathes through the mouth, the nasal space becomes blocked with adenoids. The formation of the jaw is altered, the palate becomes high, and the face has a very stupid expression, and not only is the face stupid in expression, but if by ill luck the ears have become affected by blocking of the Eustachian tube, which is intended to keep the air pressure on the drum even, and deafness has resulted, the child not only looks stupid, but becomes so. There is in addition serious risk of middle ear disease and death.

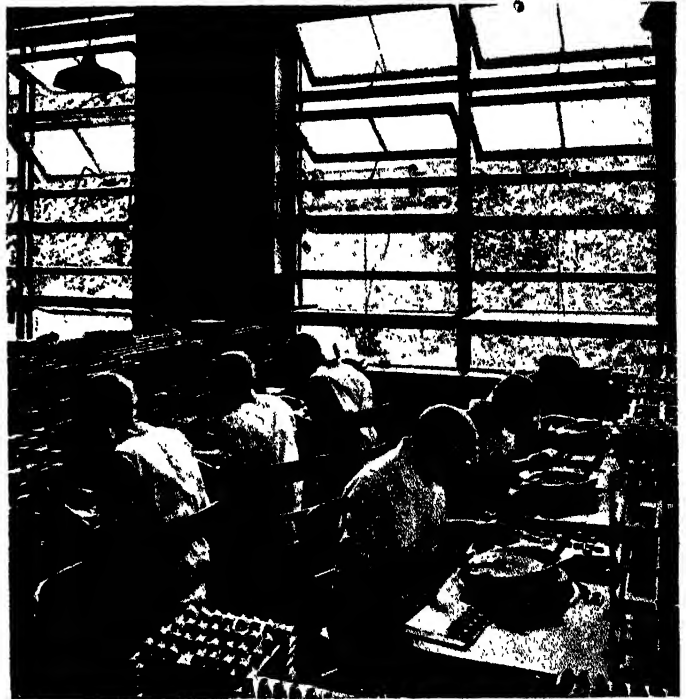
Next we have the need of fresh water. There are now many

• **Fresh Water.** fluids in the world that are the invention of man, but however pleasant these fluids may be in small quantities, we would soon tire of

them if compelled day in and day out to obtain from them the fluid required by the body to sustain life. The only drink of which we never tire is water. Life cannot be sustained many days without it. The bulk of the body is made up of water, in addition to which it is the material which forms the basis of our digestive juices, and the vehicle in which the waste products of the body are passed out *via* the kidneys. There is need of fluid in the form of perspiration to regulate the temperature of the body, and much is given off with the breath.

Where men are serving in tropical climates, the greatest demand is for a pure water supply, and when that supply runs short the suffering is intense.

In the process of evolution, from the stage in which our earliest forebears, the amœbæ, lived in the sea, and took in the particles of food in the water, our actual life has depended on the existence of fluids as a solvent for our food, and the carrier away of our waste material. To the average person the



(Courtesy)

Cadbury Bros. Ltd.

A WELL-VENTILATED WORKROOM .
A modern factory with wide-open windows.



Courtesy]

A GARDEN HARVEST

[Rocklands School, Hastings

The huge population of our cities makes the supply of fresh vegetables a difficult matter. These children appreciate the advantage of home-grown vegetables and fruit.

intestine is thought to be a refuse tip of the body, but such is not the case. The actual body is the tissue which is enclosed by outside skin and the mucous membrane which lines the digestive tract.

To enable this fact to be appreciated I would point out that people can and do live weeks with the main street blocked, but death ensues in a few days if for any reason the kidneys cease to function, the reason being that the poison products of tissue waste in the body are carried by the blood stream to the kidneys, and are there picked out and passed out of the body in the urine. It is obvious, or should be so, that the amount of waste matter which can be held in solution by water is limited, and, as the density of the blood cannot be reduced, the kidneys can only use a certain proportion of the fluid brought in the blood to the kidneys. Shortage means the leaving behind in the tissues of waste material which tends to accumulate. The skin of the person looks muddy and toxic.

The water taken in with the food is got rid of in four ways :

First, by the breath, and the amount so disposed of is considerable on a warm, dry day.

Second, the skin gives off a large amount, depending on a number of factors :—

- (1) The surrounding temperature, and
- (2) The degree of exertion undergone.

It is by this means that we prevent the evil effects of great heat in the tropics. The normal temperature must be kept at 98.4, and in the tropics 110 in the shade is not uncommon. It would be fatal if the body were to attain and remain at this temperature, so the skin secretes perspiration, and evaporation of this reduces the temperature.

It is unpleasant, and may be dangerous, to sit in a draught of cold air when the skin is moist with perspiration after severe exertion, so, in advocating fresh air, we do not imply draughts.

If it were not for the sweat glands it would not be possible for men to work in foundries and the like. But the demand for moisture in these conditions is so great that the kidneys may be robbed and quite unable to clear the poisons I have mentioned.

THE FOUNDATIONS OF HEALTH

Where insufficient fluid is taken the demand of the body is so great that it extracts every possible drop from the main street of the body, and in so doing takes in poison material which is on its journey down the street.

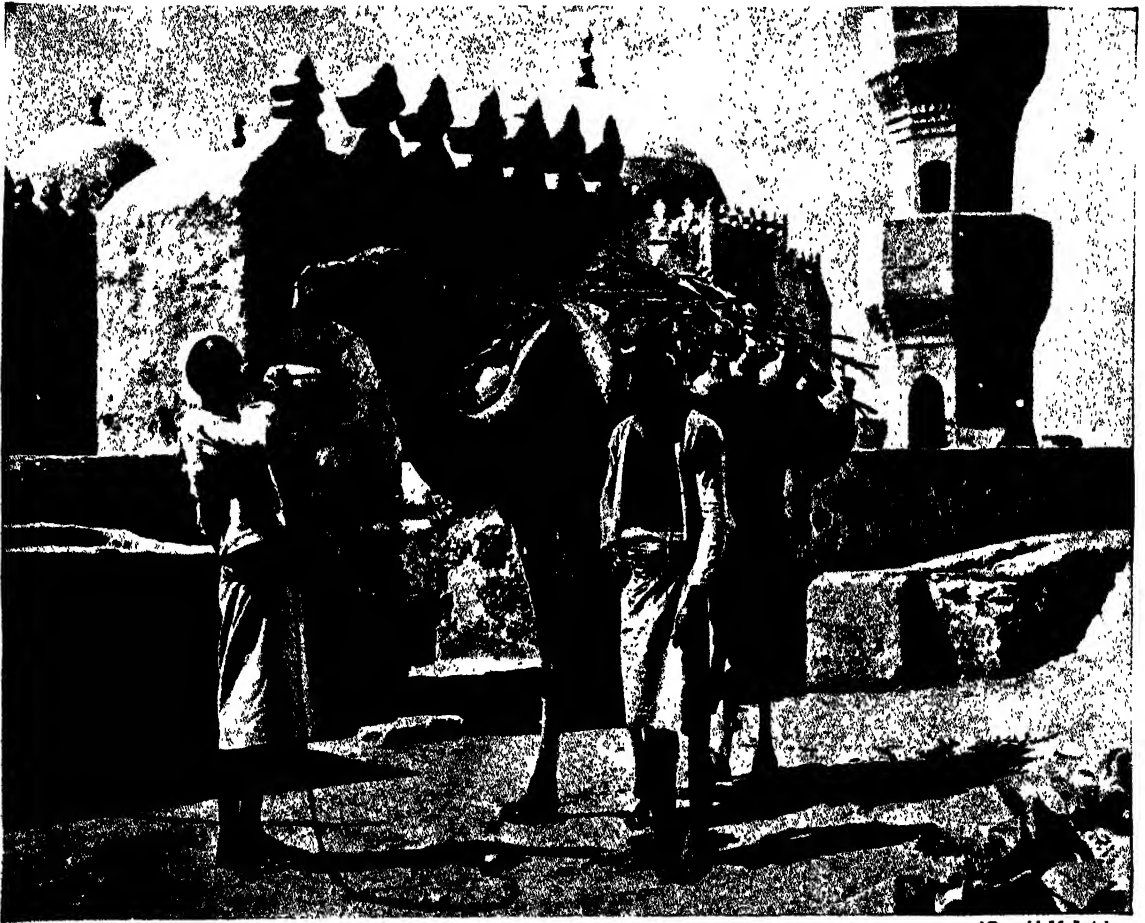
The fourth means of fluid disposal is by the bowel itself, and when the conditions I have mentioned prevail, the shortness of fluid means constipation, and its attendant evils.

When should fluids be taken and how much? The best time to drink would be about an hour before meals. This would then be useful in washing out the stomach. But when this is not practicable, take it at the end of the meal. The harm of drinking with meals is apt to be overrated.

Provided that the food is properly masticated, a reasonable amount of water is not in the least harmful, but you should remember that the stomach is not an elastic bag, it is a vital organ, and even water should be swallowed slowly.

The best time would be a tumbler of water when called, another about midday, a third in the afternoon, and a final about bedtime. These four tumblers being in addition to the ordinary fluids taken with meals, such as tea and coffee.

Plain water is the best form of fluid for cleaning the body both inside as well as out, but we must think of the desires of the palate. Weak tea is a pleasant drink, and in moderation does no harm, but when over-brewed and very strong, it is distinctly harm-



A WATER SELLER IN ARABIA

[Donald McLeish

In tropical countries the greatest demand is for a pure water supply, but in many desert regions primitive methods such as this still prevail,

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ful. Tea is a stimulant, and therefore is liable to abuse. Unfortunately, many people take it in excess, but because of this there is no need to cut it out of life entirely. To some it acts as a poison, even when freshly brewed, and it may be taken as a fact that even weak tea is bad for children, but strong tea is certainly bad for adults.

Fresh food is absolutely essential if health

sumption, and only those who have country homes and their own gardens can appreciate the difference between vegetables collected and cooked at once, and the stale vegetables of the town. Cold storage ships have made it possible for fruit to be obtained all the year, but it is still an expensive article of diet.

The Registrar-General's Report for 1923, in which causes of death were tabulated,



CHILDREN AT PLAY IN HAMPSTEAD

[Donald McLeish

Town-planning schemes in our cities and large towns now include adequate playing-grounds for the children as an essential part of their programme.

is to be maintained. It is said that "one man's meat is another man's poison,"

and while this may be true, there can be no questioning the fact that to-day the bulk of people live on food from which most of the vital properties have been removed.

The huge collection of people in our great cities like London has created a problem which must tax the purveyors of food to the utmost. The transport of vegetables means a great interval between cutting and con-

sumption, and only those who have country homes and their own gardens can appreciate the difference between vegetables collected and cooked at once, and the stale vegetables of the town. Cold storage ships have made it possible for fruit to be obtained all the year, but it is still an expensive article of diet.

Agricultural Labourers	.	.	.	45
Clergymen	.	.	.	52
Inn and Hotel Servants	.	.	.	102
Butchers	.	.	.	105
* Merchant Seamen	.	.	.	110

What other factor than diet can account for such a difference in cancer incidence?

* These men live mostly on preserved meat, as relatively few of them are carried on the big liners, where a generous vegetable diet is possible.

THE FOUNDATIONS OF HEALTH

Having stressed the need of fresh air, fresh water, and fresh food, I would like to emphasise the need for recreation.

Sleep and Recreation. Sleep is essential, as, during the hours of sleep, the amount of waste material formed in the body is much less than during waking hours, and so the tissues are able to get rid of the accumulation. Without sleep, death would ensue in a very short time.

Recreation means a re-creation of energy, and the problem to-day is to provide suitable playing-grounds for our young folk. For those who can take a long holiday, I advise that it should be broken up into three periods.

The last point I wish to make is the very important one of periodic medical examination. The human machine has in it the power of repair, but under modern conditions we are putting our bodies to a strain little dreamt of by our ancestors. The fact of being examined will not produce a defect, and it may in many cases detect disease at a stage at which cure can be effected. Doctoring means teaching, and doctors would be better occupied in teaching their patients how to keep fit than in trying to patch up broken machines.

DIET AND HEALTH

*By Sir W. ARBUTHNOT LANE, Bart.,
C.B., M.S., F.R.C.S.*

It is hardly necessary in these days for me to produce more than a very limited evidence bearing on this subject,

Wonderful Experiments. and which is incontrovertible. To commence with, I would point to the experiments made by

Dr. Alexis Carrel in the United States in 1911, when for the first time in history he succeeded in growing living tissues upon a microscope slide, and for which and other research work he was awarded the Nobel prize. By means of these experiments he demonstrated the overwhelming importance of the removal of the products of digestion of these cells at sufficiently frequent intervals,

and that any neglect to eliminate the evacuations often enough resulted in the lowering of the vitality of these cells and later in their death. Every cell in the body behaves as the whole body. It obtains its nutriment from the blood, digests it in its interior, and discharges the products of its digestion into the blood stream for the excretion by the kidneys, etc. The tissues that he fed and to whose drainage he attended at sufficiently frequent intervals, grew and thrived, and he demonstrated that with suitable food and efficient drainage these cells can *live indefinitely*. I received an invitation to attend the Food Congress at Battle Creek, at which Dr. Carrel showed the foetal chicken's heart which I saw starting on its cycle of growth in 1911. It was living and growing actively in 1928, seventeen years after the initiation of the experiment. He was able to exhibit a cinema film in which were reproduced the details of the process of growth of living tissue upon a slide. This experiment shows in the clearest manner possible what a preponderating part drainage plays in the maintenance of the health and vitality of our tissues as compared to diet.

Let us turn now to the experience of Colonel McCarrison, who is still in the service of the Indian government, studying diet and its influence upon health and upon the freedom from disease. Perhaps no other observer has done work approaching in excellence that which he has carried on in this branch of dietetics.

The complete freedom from any of what can safely be called the diseases of civilisation, or for all practical purposes diet diseases, all of which are consequent on static changes in the gastro-intestinal canal, of those races who live on good food and whose habits are regular and efficient, can be clearly demonstrated by quoting Colonel McCarrison's own words :—

“For some nine years of my professional life my duties lay in a remote part of the Himalayas, amongst isolated races far removed from the refinements of civilisation. Certain of these races are of magnificent

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A FINE WEST AFRICAN TYPE

This West African has the health and vigour typical of native races still unspoiled by civilisation.

[Central Press

physique, preserving until late in life the characters of youth; they are unusually fertile and long lived, and endowed with nervous systems of notable stability. . . .

"During the period of my association with these peoples, I never saw a case of asthenic dyspepsia, of gastric or duodenal ulcer, of appendicitis, of mucous colitis, or of cancer, although my operating list averaged over 400 operations a year. While I cannot aver that all these maladies were quite unknown, I have the strongest reason for the assertion that they were remarkably infrequent. The occasions on which my attention was directed to the abdominal viscera of these peoples were of the rarest. I can, as I write, recall most of them—occasions when my assistance

was called for in the relief of strangulated hernias, or to expel the ubiquitous parasite—*Ascaris lumbricoides*. Amongst these people, the abdomen over-sensitive to nerve impressions, to fatigue, anxiety, or cold, was unknown. Their consciousness of this part of their anatomy was, as a rule, related solely to the sensation of hunger."

In a letter he wrote to me, was the following passage:—

"For myself, I work on, more and more amazed, day by day, by the extraordinary effects of faulty food on the animal organism. I begin to think that faulty nutrition is the bedrock cause of the vast majority of tissue ailments."

Another illustration of the fact that people living on a perfect diet and having normal habits of life are free from

Cradle of the World. the diseases which affect civilised communities is afforded by this quotation from a book written by Dr. Ernest H. Tipper, entitled *The Cradle of the World and Cancer*, in which he de-

scribes his experience of twenty years spent among the primitive race which inhabits Benin, West Africa, a race quite distinct in type from those among whom Colonel McCarrison lived. He states that "The average daily number of cases seen during my twenty years' service in West Africa was about sixty, exclusive of official rating, yet I only saw six cases of cancer altogether; five of them were in coast stations, the other one away in the grass country, but not one case amongst those two million people in the heart of the Niger Delta; and I only once came across a case of appendicitis when in charge of a coast station, and that was not a clear case."

Can anything be more impressive and striking than these statements made by men

THE FOUNDATIONS OF HEALTH

of great experience? These testimonies can be supported by those of many other very skilled medical men, but it is quite unnecessary to quote them here.

The physique of those native races referred to here by Colonel McCarrison and Dr. Tipper far excels that existing in communities living in a state of civilisation. All over the world the influence of the diet and habits of the white man is deteriorating these robust races wherever contact is effected between them, and the process of degeneration goes on till finally the physique of the native and his liability to disease become identical with that of the people amongst whom his lot is cast. Observe, for instance, the steady degeneration of the negro and his incidence to the diseases of civilisation as he ascends through the Southern States of America till he reaches Chicago, when the relation of cancer and all the other evidences and consequences of civilisation are identical in the negro with those of the white inhabitants of that town. That the health and

Denmark's vitality and freedom from disease of a highly civilised community can be improved very materially in a short period of time by the use of a diet which approaches in its composition that eaten by native races who are free from our diseases, is demonstrated by the result of the measure adopted by the famous physiologist, Dr. Hindhede, when, during the Great War, an entire nation, that of Denmark, was faced with the probability of a terrible famine, with

the consequences which would, in the ordinary course, inevitably result from it. Dr. Hindhede added to the diet of the people all the food and roughage which would otherwise have been fed to the vast number of cattle which he caused to be killed. He kept alive such as the cows and fowls to provide food for the children. One would naturally expect that much gastric irritation would have resulted from the ingestion of such a quantity of material which would be considered by many to be most indigestible, and consequently irritating to the mucous membrane of the gastro-intestinal tract, but, on the contrary, the mortality was reduced to a point never previously reached, while the vigour and vitality of the people was so increased that the terribly fatal epidemic of influenza which swept through Europe left practically no mark upon the Danes.

This experience should do much to destroy the belief that such roughage can exert any other than a beneficial effect on digestion.



[Courtesy]

[“Birmingham Gazette”]

MILK FOR GROWING CHILDREN

It has been proved that the addition of one pint of milk a day to the diet of growing children can nearly double their average annual gain of weight and height.

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Numbers of other experiments on a less gigantic scale can be adduced to confirm the fact that roughage, as part of diet, is not only beneficial, but indeed absolutely essential to perfect health.

A further evidence of the influence of a natural food such as milk in increasing weight and height and the resisting capacity to disease, is well indicated by the experiments made by Dr. Corry Mann upon the boys in the Barnardo Homes, England. He found that the addition of one pint of milk a day to a diet which, by itself, satisfied the appetite of growing boys fed upon it, could convert an average annual gain of weight of 3.85 lbs. per boy into one of 6.98 lbs., and an annual average increase of height from 1.84 inches to 2.63 inches. This remarkable betterment was proved by trial to be due, not to the relatively small increase in the fuel value of the dietary, nor to the extra protein supplied in the milk, but rather to more specific qualities of milk as food. Besides increasing the weight and height of the boys, it improved their resisting power to such infections as occurred frequently among boys on the basic diet. All this improvement was maintained over a period of one, two and three years.

I have now shown (1) that we have, on the one hand, vigorous races living under "natural conditions, quite free from

Summary. all the diseases of civilisation;

(2) that the adoption of the diet and habits of civilisation by these people results in the acquisition of our diseases proportionately to the duration of their exposure to our diet and habits, till, when these become equal, the incidence of diseases becomes equal; (3) that the incidence of disease and death may be reduced by approximating the habits and diet of the members of a highly civilised nation to those of the native; and (4) lastly, that by the addition to the diet of growing youths of a quantity of milk, the vigour, height and weight, health and resisting power to disease is increased in a most striking manner.

It is necessary to speak with complete

frankness concerning the manner in which self-poisoning takes place in the civilised individual, laying the foundations of ill health and disease.

The explanation of the freedom of the native from our diseases while living in normal conditions is that his gastro-intestinal tract acts as efficiently as the drainage scheme of the home. When the pan of the closet is emptied, the material contained in it passes through the syphon trap, through the drain, the cesspool in the area, and from it there is evacuated into the drain in the street a quantity of the contents of the cesspool corresponding in quantity to that which passed from the pan into the syphon trap. Because of the nutritive and stimulating qualities contained in the mother's milk consumed by the native child, material passes rapidly through the large bowel and is passed automatically at an interval after each feed in a porridge-like consistence.

The milk of the civilised mother is usually deficient in such components as are present in that of the more vigorous native, so that the child does not evacuate its bowel with anything like the same certainty and regularity as does the child of the robust native woman.

Again, early in the life of the civilised child, the mother "regulates its bowels."

In other words she regards one action a day as sufficient, and teaches the child to control any desire to evacuate the contents of

the large bowel, except on a single occasion. What she does is to endeavour to force the end of the colon, which has been developed for ages to hold only a quantity corresponding to the input, to be occupied by the products of twenty-four hours' nutrition.

This would naturally result in an elongation and distension of this section of the colon to accommodate all this accumulation, but in accordance with a law which I formulated many years ago, namely, "that we have a simple mechanical relationship to our surroundings, and that any alteration in this relationship is followed of necessity by a corresponding alteration in our

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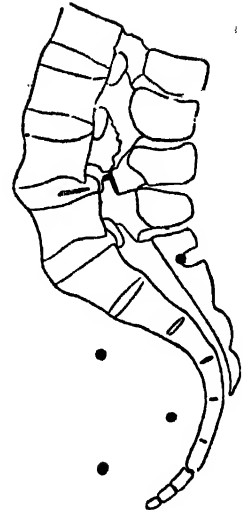
anatomy," bands and membranes form, which fix this segment of the bowel, its elongation and distension, and cause the balance of the twenty-four hours' faecal matter to be accommodated in that part of the colon nearest to the area of fixation.

These bands later contract and control the effluent through the fixed section of the bowel, and in accordance with the corollary of my law, namely, "that anything that nature does to enable the individual to meet the altered mechanical relationship tends to

trap of the system, the over-distension of the duodenum, with ulceration of its mucous lining, the spasm of the pylorus and the distension of the stomach by material which accumulates in it, the strain upon the upper curve of the stomach is followed by the congestion and later the ulceration of its mucous membrane, and this ulceration, like that about the anchored colon, being chronic, tends to become infected by the organism of cancer.

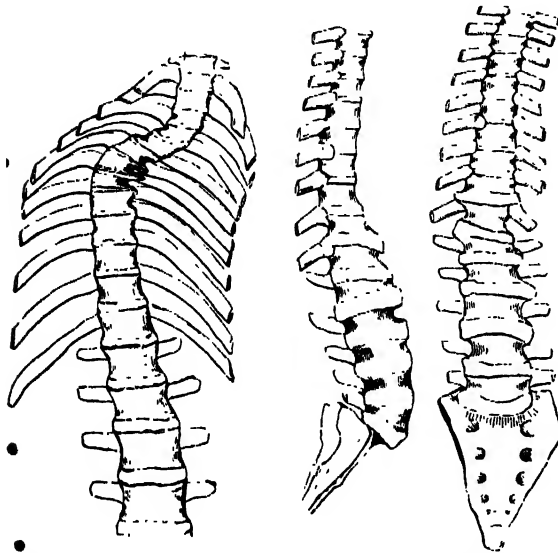
The absorption by the blood-vessels and lymphatics of toxins (poisons) and organisms from accumulated material decomposing beyond the normal and infesting the food supply in the small bowel with their virulence, becomes greater than the liver, kidneys, and ductless organs can deal with, and the poisons circulate through the entire body, lowering the vitality of every cell, and causing their degeneration. In consequence, diseases appear which are unknown to the native, whose drainage scheme acts normally.

Elimination of such diseases can only be effected by instructing people in the laws of health, and by rendering accessible to them just such foods as are essential to health.



COAL-TRIMMER'S SPINE (Lower Part)

The coal-trimmer, in shovelling coal in the hold of a ship, twists his spine forcibly and makes a loose joint between the fourth and fifth lumbar vertebrae.



CHANGES IN THE SPINE UNDER ABNORMAL CONDITIONS

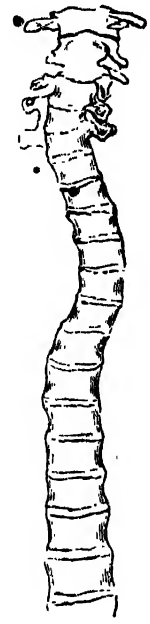
Any alteration in our simple mechanical relationship to our surroundings is followed by a corresponding alteration in our anatomy. The drawings show (left) the spine and ribs of a brewer's drayman who is continually carrying barrels of beer on his right shoulder; (centre and right) spine of coal heaver, altered by his very laborious occupation.

shorten life," mechanical changes ensue in the whole gastro-intestinal tract, followed by an invasion of the contents of the small intestine by organisms which ascend from the faecal matter which has accumulated and caused abnormal putrefactive changes in the colon.

In other words, over and above such mechanical results as elongation and pro-

lapse of the large bowel, the formation of additional bands to support it, the kinking at the duodeno-jejunal junction with the control of the effluent of the duodenum or syphon

Nature's
Revenge.



DEFLECTED BY HEAVY LOADS

Some of the changes that develop in a man who carries loads upon his head.

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A HEALTHY DIET

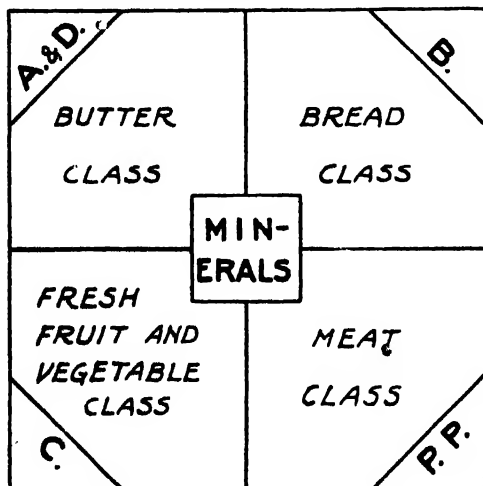
By Professor R. H. A. PLIMMER, D.Sc.,
Professor of Chemistry in the University of London
at St. Thomas's Hospital Medical Schools, and
V. G. PLIMMER.

OXYGEN from the air, water to drink and food to eat supply all the material needs of the body. The food has to provide in suitable amounts the various substances required for the upkeep and proper working of the animal body.

Good health and resistance to infection depend upon the correct choice of foods. Badly chosen diets lead, inevitably, to ill health and lowered resistance to infection. The prevalent ailments, constipation, indigestion, heart diseases of "unknown origin," gastro-intestinal troubles, rickets, tuberculosis, can, in most cases, be traced to the consumption, for a long period, of a mixture of foods which failed to supply the body with all that it needed.

No single food-stuff is a complete food for the adult. A mixed diet is taken in the hope that the incompleteness of one food will be made good by some other kind. Even milk for the infant is not a satisfactory food unless the mother is supplied with a proper and complete diet.

The common classification of foods into



A SQUARE MEAL

The four squares represent the four types of food which are essential for a complete diet—and the centre and the corners (the vitamins) must be included.

four groups is convenient. The diet as a whole can be pictured as a square, and a square is not a square if the corners are cut off, as they are in the case of incomplete diets. The square represents all that the food should give to the body to maintain it in that state of good health and efficiency which every one desires.

The diagram of the square with a larger central portion and four corners shows a healthy diet.

The question is how to fill the central part and the four corners?

The figure represents the four classes of foods as of equal size because they are equally necessary and indispensable, but the actual consumption of the different groups is not equal in weight. Attention must be given to the relative quantities of the four classes of food.

THE MEAT CLASS.—Experience has proved that 8 oz. of the meat foods per day, spread over the several meals, is the most suitable quantity. The meat foods are :—

Lean of meat, including poultry, game, and all flesh foods, whether fresh, dried, frozen, tinned, or salted. Fish of all kinds. Eggs, cheese, milk.

The usual daily amounts are from 4 to 6 oz. of meat or fish, $\frac{1}{2}$ pint of milk, 2 oz. egg (1 egg), and about 1 oz. of cheese. They can be interchanged as desired. Larger quantities every day are unnecessary and wasteful, though occasionally the above amount may be exceeded.

THE BUTTER CLASS.—On the average, from 2 to $3\frac{1}{2}$ oz. of butter and fats are eaten daily.

THE BREAD CLASS.—The bread class of foods, consisting of starches and sugars, forms the greater part of the daily food. The total amount corresponds to about 2 lb. of bread per day.

The bread class of foods is ordinarily somewhat as follows : $\frac{1}{2}$ lb. of Bread, $\frac{1}{2}$ lb. of cakes, puddings, biscuits, $\frac{1}{4}$ lb. of sugar and sweet foods with some starch and sugar from vegetables and fruits.

THE FRUIT AND VEGETABLE CLASS.—In this class, potatoes are eaten in the greatest amount ; green and root vegetables and

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fruits are the other foods of this class. From $\frac{1}{2}$ to 1 lb. of potatoes a day is a common daily quantity.

All the above are healthy quantities. An increase of all four groups, especially of the bread class, is wanted for any hard manual labour. An increase in the meat class only is not correct. Excess of the meat class of food is the most common mistake in the daily diet. Children need, *proportionately*, a larger quantity of the meat class than adults, best given as milk, or eggs, or fish. There should not be a great preponderance of the bread class, as is the case in the excessively starchy and sugary diet usually given to children.

Observing these correct proportions the central part of the diagram becomes filled naturally by the dictates of the appetite. These proportions of the four classes of foods will generally give just enough of those necessary minerals which are represented by the small central square. The mineral supply is still more satisfactory if attention is given to those foods which go to fill the four corners.

The four corners indicate the *health* properties of the foods as contributed by the vitamins. Different vitamins are **Vitamins.** associated with each class of foods.

Without vitamins a diet soon leads to **disease** and death. With just a little but not enough of the vitamins, death is not so soon. With more but still insufficient, there is chronic ill health of various kinds. It is only with a full amount of the several vitamins that there is proper and perfect health. It is most essential that the firm foundations of health be laid in infancy and childhood. The system thus strongly built up is then more able to withstand any errors made in later life.

Vitamins A and D come from the butter or fat class of foods. The fats vary greatly in the amount of these vitamins which they contain. Hence there is the possibility of getting too little of these vitamins. The butter class can be divided into two groups:—

Fats with vitamins A and D—Butter, cream,

milk, meat fat, fish fat, more expensive margarines, egg yolk, green vegetables.

Fats without vitamins—Bacon fat, lard, cheaper margarines.

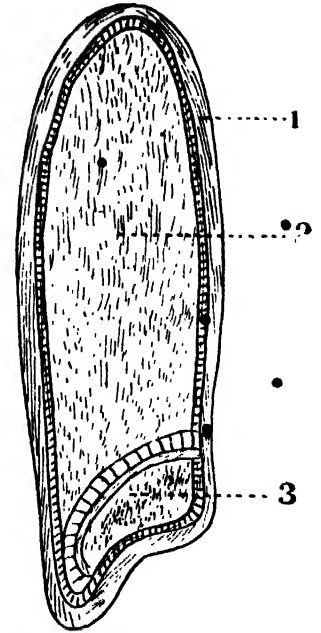
There are two possible reasons for a lack of these vitamins. We may not get enough if our fat is largely or mostly bacon fat or cheaper margarine, or there is too little of the proper fats in the diet by having an excess of the starchy foods. This is most often the case with children, and hence the prevalence of rickets.

SUNSHINE is another necessity in connection with the fat of the diet. The fat may contain the forerunner or provitamin of vitamin D. The ultra-violet light from the sun makes it into vitamin D. This action takes place through the skin.

There is one other fat, though not an ordinary food, which is very rich in both vitamins A and D. This is cod liver oil. A teaspoon daily for children will fill the corner.

Vitamin C comes from fresh fruits and vegetables, which have long been recognised as an essential part of the diet. The quantity required is, however, not so well known.

The smallest amounts consistent with health are 1 oz. of orange or lemon juice a day, or about 7 oz. of apple or banana, or 10 oz. of cooked potato. A mixture of fruits and vegetables must make up a corresponding amount.



SECTION OF WHEAT GRAIN

(1) Bran, supplying vitamin B and phosphates. (2) Endosperm, giving white flour poor in protein and vitamins. (3) Germ, rich in protein, fat, vitamins A and D, and organically combined phosphates.

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Vitamin C is spoiled by cooking. Cooking must be for as short a time as possible, and soda or its bicarbonate should never be used. Dried and preserved fruits do not take the place of fresh ones, though tinned fruits and vegetables prepared by the modern processes are as good as the fresh material.

Vitamin PP is usually not lacking in the common daily diet. The meat class of foods which, as stated above, is often taken in excess generally gives plenty of this vitamin. Modern researches show that it is associated with vitamin B.

Vitamin B is the one most commonly taken in too small an amount. There are two very distinct groups of the bread class of foods :—

With Vitamin B.

Whole meal flour.
Whole meal bread.
Oatmeal.
Brown rice.
Brown barley.
Dried peas, beans, lentils.
Nuts.
Potatoes.

Without Vitamin B.

White flour.
White bread.

White rice.
Pearl barley.
Sago, tapioca.
Cornflour.
Sugar of all kinds.

Examination of the ordinary diet will at once reveal the fact that the bulk of the bread class of foods is taken from those without vitamin B.

Every effort ought to be made to consume whole meal flour in bread and cakes, etc., at all times, but there is one other way of consuming enough vitamin B, and that is by adding to the customary deficient diet some food which is very rich in this vitamin B. Two such foods are available. The one is wheat germ, which is now easily procurable under the name of "Bemax," the other is yeast. Yeast itself cannot be regarded as a natural food for man, but yeast extract, "Marmite," is a concentrated vitamin B containing food. Wheat germ is that important part of the seed which is removed in milling to produce white flour. To the modern diet, consisting most largely of white flour and sugar, the amount of these concentrated foods which must be added is from $\frac{1}{2}$ to 1 oz. a day.

If one remembers how to choose the foods to make a square meal every day, the rest of the diet will almost look after itself, and one should be able to eat anything one likes.

This short summary of the essential points about foods cannot give more details about the foods themselves. A fuller account will be found in the later section on "Nutrition and Health."



AN APPLE A DAY

[E. A. T. Cusworth]

Fruit supplies the health-giving vitamin C to the system

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[Courtesy]

[High Commissioner for N.Z.]

THE CLEANEST BABY IN THE WORLD

New Zealand Maori children spend most of the day bathing in the hot springs. This photograph was taken at Rotorua.

WATER AND HEALTH

By *ETHEL BROWNING, M.D., Ch.B., late House Surgeon, Liverpool Stanley Hospital, Assistant School Medical Officer for Liverpool, and Medical Officer Garston Infant Welfare Centre.*

WATER has been declared to be more nearly a panacea for all human ills than any other known agent. Used both outwardly, in the form of baths or local applications to the surface of the body, and inwardly, as a part of the daily intake, it co-operates with the healing powers of the body to prevent and resist disease.

That water is as essential as food to the life of the organism, that it is, in fact, a food in itself, is, perhaps, more or less common knowledge, since accounts of intense suffering, ending in death, from lack of water, are by no means unheard of.

Nature has so arranged the distribution of water, in combination with other food elements, as well as in its pure fluid state, that it is difficult, in normal circumstances, to avoid taking the minimum quantity necessary to preserve life, but this minimum quantity is not enough to keep the body in perfect health; a much greater amount must be deliberately included in the

diet if the normal working of the bodily functions is to proceed without any friction.

Two-thirds of the weight of the body consists of water. This proportion must be kept constant, and since the body is continually losing water, at the rate of five to six pints a day, the loss must be replaced by at least as much taken in the form

We are
Two-
thirds
Water.

of fluid or water-containing foods.

When the sources by which water escapes from the body are considered, it will be seen that they are principally concerned in the removal of waste products, and the more speedily and efficiently these poisonous substances are removed the less the likelihood of ill effects arising from their retention in the body.

Evaporation from the skin accounts for a certain proportion of the loss of water, and while at the same time exerting an important influence on the regulation of the body temperature, it serves the purpose of getting rid of toxic products dissolved in the sweat.

These substances, which include uric acid, urea, and other end-products of the breaking

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down of proteins in the process of converting them into substances which can be absorbed by the blood stream, can only be separated when in solution in water, and their retention in the body may do irreparable damage to the tissues. The same solubility of poisons in water holds good in the case of the lungs; the impurities present in the air which is breathed out can only be diffused into it from the blood stream in the presence of moisture.

It is by the kidneys and intestines,

Internal Flushing. however, that waste products are chiefly removed, and in

both cases the removal is greatly helped and hastened by plenty of water in the diet. Concentration of the poisonous substances constantly passing through the kidneys is apt to injure the cells, while free dilution renders them practically harmless. In the intestines a plentiful supply of water helps to prevent constipation and its attendant evils. As the food passes through the various parts of the digestive canal both nourishment and water are absorbed from it, until its final excreted portion contains only those elements which are definitely rejected by the digestive processes. If this portion contains too little water it is apt to become hard and slow of movement, so that there is time for absorption of poisonous compounds to take place. It is obvious,



ROMAN BATHS AT BATH

The Romans took full advantage of the beneficial properties of water; many examples of their fine bathing establishments have been discovered.

therefore, that taking plenty of water greatly assists the maintenance of health by the dilution of the necessary wastage of the body and its speedy removal.

Many people imagine that by drinking large quantities of tea, coffee, or any other beverage, they can absorb as much water as they need, but they should remember that all such fluids contain other ingredients which need further elimination. Pure water, taken in its natural state, has no such extra work to perform. Whether it is drunk cold or hot matters little, but those who make a practice of taking at least a tumblerful first

thing in the morning and last thing at night will prove for themselves the wisdom of taking advantage of its cleansing and purifying properties.

The use of water in the form of baths and outward applications to the body was one of the earliest of all known remedies for disease. It is only necessary to study the ruins of some of the ancient Roman baths to realise that the Romans took advantage of the beneficial properties of water in the highest degree.

The action of applications of water to the skin takes place in two ways; first, reflexly, by means of the connection of the skin with the internal organs by nerve fibres and centres; and second, mechanically, by cleansing the skin

External Uses.

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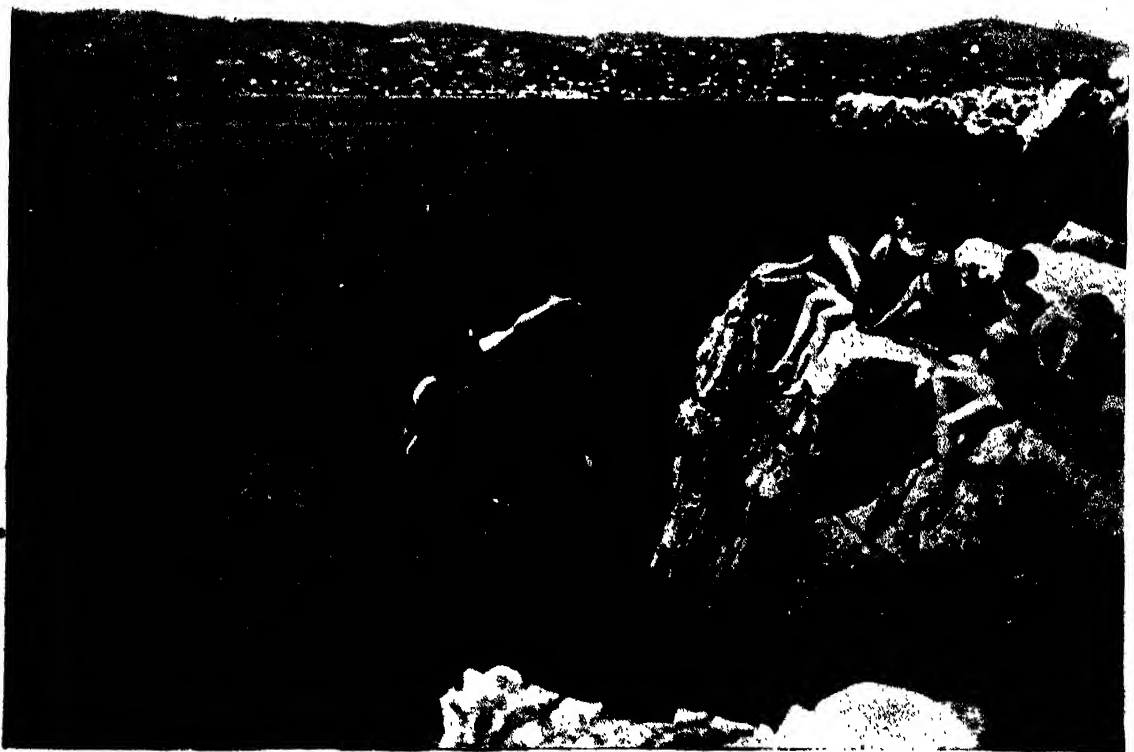
and allowing the perspiration to act freely. When the nerve-endings in the surface of the skin are stimulated they cause the small blood-vessels in the skin either to contract or to dilate, with the result that the amount of blood flowing through the surface of the body is either diminished or increased. Since the amount of blood in the whole body is always the same, it follows that the amount in the internal organs must be increased or diminished according to the contraction or dilatation of the surface blood-vessels. In this way the action of baths or local applications of water affects the internal organs according to their temperature, for the water either gives heat to the body or takes heat away from it, and the surface vessels are stimulated by heat to dilate, and by cold to contract.

Baths are called cold, tepid, warm, or hot within certain ranges of temperature, as

follows: Very cold, 32-55° F.; Cold, 55-65° F.; Tepid, 80-92° F.; Warm, 92-98° F.; Hot, 98-104° F.; Very hot, over 104°. A full bath of 120° F. is dangerous to life in most people.

In healthy individuals cold baths are generally very beneficial as a tonic, producing invigoration and a sense of buoyancy. Normally they should produce a certain action and reaction in quick succession. Their immediate action produces a sensation of cold, pallor (due to constriction of the surface blood-vessels) shivering (due to an involuntary contraction of the muscles in an attempt to overcome the cold by producing more heat), quick, gasping respiration, no perspiration, and a slight rise of the internal temperature. The subsequent reaction produces a sensation of warmth and well-being, redness of the skin, a slow pulse, free

Cold
Baths.

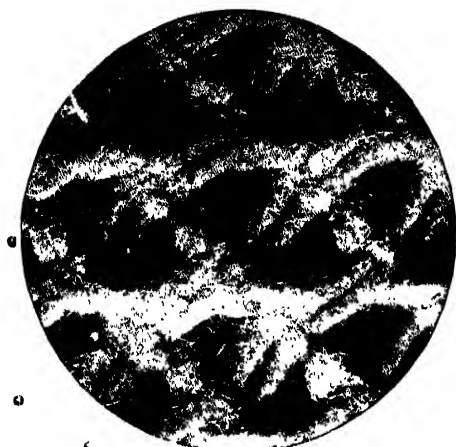


Bartram Park

HEALTH-GIVING EXERCISE

Bathing is very beneficial to most healthy people, producing invigoration, high spirits, and a sense of buoyancy and elation.

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AIR-CLEANSER PAD, FIG. 1.

A medicated air-cleanser pad is here shown before use.

respiration, increase of perspiration and a fall of temperature. When the reaction does not take place, unpleasant sensations indicate that the baths are harmful. They should not be taken by very old people, or by very young children, or in cases of exhaustion, rheumatism, obesity, kidney disease, or extreme nervous irritability.

WARM BATHS have a general sedative effect, and help to induce sleep if taken at night.

A hot bath produces a slowing of the pulse, followed by an immediate quickening, a temporary rise of the internal temperature, increased perspiration, and a general nervous excitation. The subsequent reaction produces pallor, from surface constriction, a quick pulse, quick respiration, a lowered temperature, lessened perspiration and a sense of drowsiness and muscular fatigue. Hot baths are beneficial after excessive muscular activity, by getting rid of accumulated poisons through the skin and by reflexly stimulating the nerve centres. They should be avoided in old age, infancy, and in people who suffer from heart trouble or a high blood-pressure.

Haemorrhage can often be checked by either very hot or very cold applications.

The daily warm bath keeps the skin in good condition, and allows the normal processes of the body to go on unhampered by the accumulation of waste materials which it no longer requires.

FRESH AIR AND HEALTH

By C. E. A. WINSLOW, *Professor of Public Health, Yale School of Medicine, New Haven, Conn., U.S.A. Chairman, New York Commission on Ventilation. Member, Health Committee, League of Nations.*

THE layer of atmosphere which encloses the whirling globe on which we live is primarily made up of four parts of nitrogen and one part of oxygen. The oxygen is, of course, the first and foremost essential of life, since the life process is a slow combustion, in which the oxidation of food is the underlying source of all vital energy. In the deep parts of mines oxygen may be insufficient to support the vital process; and at high altitudes the air is so rarefied that this process is difficult.

In ordinary rooms at the surface of the earth the problem of oxygen supply is, however, of no practical moment, for in the worst ventilated room the oxygen falls only from 21 per cent. to 20 per cent.

The oxidations of the body produce in the air an increase in carbon dioxide, and this was first thought to act as a chemical poison. Fifty years ago, however, it was shown that these changes are far too small, even in a very badly ventilated room, to produce any important effect upon the human economy. Then it was guessed that some more subtle chemical poison, "crowd



[Deados

AIR-CLEANSER PAD, FIG. 2.

Showing the surprising quantity of solid impurity collected after several hours' use.

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poison," might be contained in the organic substances given off as a "body odour" from mouth, teeth, skin, and clothing. Here, too, scientific researches have yielded negative results. It appears that stale odours of this kind do exert a certain indirect influence upon health by decreasing appetite and inclination for physical activity; but there are no poisons present in the air of the worst ventilated room which can account for the uncomfortable sensations there experienced.

In certain industrial processes there may be present fumes and dusts (of benzol, or of lead salts, for example), which are highly dangerous to health. In others, silica dust may be generated which exerts a peculiar and deadly influence in predisposing to tuberculosis. Carbon monoxide (a very much more serious poison than carbon dioxide), may be produced in fatal concentration by an automobile engine in a closed garage or by leaking gas or defective gas heaters in the home. These, however, are all special cases, with which we are not here concerned. Our present problem is that of the ordinary living room, school room, work room or assembly room where the air is vitiated only by human beings themselves or by sources of heat or light operating in a normal manner. In such a room, even though badly ventilated, the chemical composition of the air has little or no influence upon human welfare.

What then is the source of the trouble? Why did the victims in the Black Hole of Calcutta perish in agony and why do those who live and

work under less extreme conditions of bad ventilation exhibit less marked but definite ill effects? To answer this question we must turn to a quite different field of physiology than that concerned with respiration. It is not "the air we breathe" which causes the diffi-

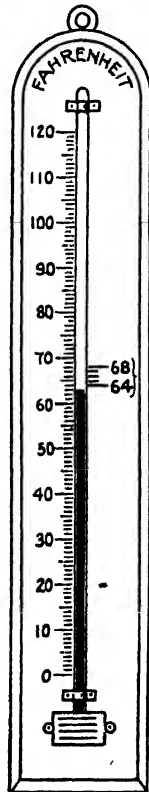
culties associated with bad ventilation (apart from the special cases of industrial or carbon monoxide poisoning). It is the air which bathes our bodies.

The slow combustion in our tissues, like any other combustion, produces heat; and the heat thus formed must be eliminated, so as to keep the temperature of the body always close to the optimum of 98.6° F. The system by which the body accomplishes its task of heat regulation, with varying heat

production within and varying air conditions without, is one of the most delicate and complex pieces of coordinative machinery in the living machine. It has its definite limits, however. If the external temperature be too high the mechanism fails to work satisfactorily. The heart rate rises, the blood-pressure falls, the body temperature itself increases by a fraction of a degree. We become dull and listless and disinclined to activity. Studies carried out by the New York Commission on Ventilation have shown that even a temperature of 75° is accompanied by a 15 per cent. decrease in physical work as compared with that performed at 68°.

Moderately low temperatures are in themselves less serious than high ones, provided that the body is acclimated to them. In hospitals for children with tuberculosis the patients can be gradually accustomed to live outdoors in the depth of an American winter with the lightest of clothing. Sharp changes of temperature, with persons whose system of temperature control has been weakened by habitual living in overheated rooms, are highly danger-

ous, and draughts which chill one part of the body unduly are also serious in their effects. A moderate temperature, sufficiently cool and variable to stimulate the heat-regulating system of the body to work well, together with protection from debilitating warmth on the one hand and



THE IDEAL TEMPERATURE

Overheating is as dangerous as chilling draughts; an ideal temperature for living rooms during the day is 64°-68°.



[Topical

WINTER EXERCISE IN THE CHILTERN

Patients suffering from certain diseases are gradually accustomed to live out of doors in the depth of winter with only the lightest of clothing.

from undue chill or draught on the other, are the fundamental essentials of "fresh air."

The effect of the atmosphere upon heat loss from the human body is governed not only by its temperature but also

The by two other characteristics of the air—its humidity and its motion. In cool air the body

loses heat chiefly by direct conduction, and conduction is increased by moisture in the air and clothing. This is why a cold damp day feels chillier than a cold dry day. When the outside temperature is high, the body loses heat largely through the cooling effect of the evaporation of perspiration. Moisture in the atmosphere checks this evaporation, and so a hot damp day feels hotter than a hot dry day. Finally, air currents tend to break up the layer of hot moist air which immediately surrounds the body so that, at the same temperature, a windy day is vastly more comfortable than

a still one. A temperature of 72° outdoors in summer may be all that could be desired, while the same temperature indoors in winter would be most objectionable.

The importance of such effects of the atmosphere upon health, comfort, and efficiency would be difficult to overestimate. Professor Ellsworth Huntington has shown that climate and season exert a determining influence upon industrial efficiency, upon mortality, and upon national development, and that the four areas upon the earth which have an ideal climate are precisely those areas which exhibit dominant civilisations. The ideal conditions are a mean twenty-four hour temperature of 64° and a mean relative humidity of 80% combined with the stimulating effect of moderate storminess and variability; and the areas

are western Europe, north-eastern North America, a narrow strip on the west coast of North America and an area in Eastern Asia, including Japan.

Our studies in the United States have made it clear that overheated or draughty schoolrooms exert a profound influence upon the prevalence of colds and minor respiratory diseases, and we have little doubt that the excess of pneumonia on our side of the Atlantic is directly related to the national habit of overheating living and work rooms. On the other hand, it seems highly probable that the excess of bronchitis in England is due to an excess in the opposite direction. Pneumonia is primarily affected by overheating and subsequent chill; chronic respiratory diseases by habitual chilling. If American houses were kept below 70° and English homes above 60° there would be less pneumonia in the United States and less bronchitis in Britain.

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Fresh air, then, is air that is cool, but not too cold ; moist, but not too moist ; and in moderate, but not excessive, motion. It should also, of course, be free from offensive body odours and from chemical poisons or irritating dusts. Aside from those conditions which arise in certain industries, the avoidance of overheating on the one hand and of chilling draughts on the other is the main objective of ventilation.

The first essential in air conditioning is, therefore, the use of the thermometer. No

Temperature. room is properly furnished without a thermometer, and if the temperature during the daytime goes above 68° or much below 64° * an effort should first be made to correct the condition by regulation of heat sources. In the United States, much so-called "bad ventilation" is nothing more than overheating, due to the excessive and uncontrolled energy of central heating systems. In England, it would probably contribute to the public health if existing systems were made more powerful than they are.

Ventilation. Where only a few persons are present in a room, heat losses and diffusion of gases through walls, ceiling, and fireplace, if the temperature be low outside, will accomplish all that is necessary in the way of ventilation. If the weather be warm or the room crowded, special provision must be made for admitting fresh, cool air, for removing that which has been heated by the bodies of the occupants (the average human being gives off about as

much heat per hour as a burning candle). This can ordinarily be accomplished in the living-room by manipulation of windows, with the application of a little common sense. It must be remembered that air will not move in or out unless some force makes it do so. To open one window in a still day may lead to no interchange at all ; but if one window be opened at the bottom and one at the top, difference in temperature will set up the necessary circulation.

In the sleeping-room the temperature should be kept as close to that of outdoors as possible, even in winter. The body, as a whole, should be kept from chill by adequate covers and the cold air will exert a wholesome stimulating effect upon the face and respiratory passages.

When we pass from the home to the school we find a somewhat different condition. In such a climate as the United States at least, it is impossible to ventilate a schoolroom containing twenty to forty pupils by the use of windows alone. If sufficient air change be provided by ordinary



* This figure fits American experience. It may be that in England one is successfully acclimated to a lower minimum than this.

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open windows to remove the heat produced by the occupants, those near the windows will be subjected to objectionable draughts. On the other hand, the studies of the New York Commission on Ventilation have made it abundantly clear in recent years that the common American practice of ventilating schoolrooms by fans at a rate of thirty cubic feet per minute per pupil is not only needless but positively harmful, since it almost inevitably produces either over-

a gravity exhaust duct is provided to permit the escape of hot vitiated air from a point near the ceiling. The same plan works excellently for offices or small factory workrooms.

In rooms where still larger numbers of people (100 or more) are gathered together we must perforce resort to mechanical ventilation. The amount of warmed air which must be removed and the amount of cool air which must be supplied in its place is too great to be admitted by the win-

dows (even on the plan suggested above for schoolrooms), without producing draughts. The ventilating engineer with his centrifugal fans and specially designed ducts must here be called into play; and it is upon him that we must rely for the special local exhaust systems needed in factories where poisonous gases and harmful dusts are generated.

In an auditorium it would appear at first that the logical procedure would be to introduce fresh air at the floor and take out stale air at the ceiling. Experience has shown, however, that it is very difficult to bring in cool air near the floor of a crowded assembly room without causing

complaints of draught. The best practice in such a case is to introduce air at numerous points in the ceiling and to remove it at the floor.

Finally, it should be pointed out that, whatever care we may take with the atmosphere of the interior of our dwellings, schools, factories, and offices, nothing ever takes the place of the outdoor life. The cooling effect of a summer breeze and the stimulus of a brisk winter morning cannot be duplicated by any system of ventilation.



[Topical

A CAMPING HOLIDAY

Whatever care is exercised in ventilating our dwellings, nothing ever takes the place of outdoor life.

heating or draughts, or both. In seven different studies carried on in five different cities it has been shown that in every instance respiratory diseases were more common in fan-ventilated schoolrooms than in those provided with a less violent current of cooler air. The method which we have found most satisfactory is one in which fresh air is admitted at the windows but deflected upward over slanting window boards, with radiation placed below the windows to temper it in cold weather; and in which

THE FOUNDATIONS OF HEALTH

SUNLIGHT AND HEALTH

By C. W. SALEEBY, M.D., Ch.B., F.R.S.E.,
F.Z.S., Chairman of the Sunlight League; Author
of "Sunlight and Health," etc. etc.

"In the beginning, God said, Let there be light, and there was light." In the beginning of medical science, Hippocrates of Cos, the Father of Medicine, used the Mediterranean sunlight, in which our own civilisation was born and nurtured, to cure his Athenian patients. The Temple of Æsculapius, in which Hippocrates was a priest, gave him and his patients access to abundance of unpolluted sunlight, pure air, pure water, and pure fresh food from the hills and valleys behind it. These are the life-saving agents, the things we live by, to which contemporary medicine and hygiene, our urban hospitals, our children's schools in the sun, are at long last seeking to return. As long as man remains a child and creature of heaven and earth, these celestial and terrestrial agents will be his means of life and healing.

The pagan world fell, and with it much evil; but also such true beginnings of philosophy and science as those of which we now remind ourselves. For long, dark ages they were lost. Two thousand years after Hippocrates, kings of France and England were using their "sovereign touch" to cure the King's Evil, which was for the most part tuberculosis, the prince of the powers of darkness, the most deadly of those diseases to which is given the name, now widely used, of the "diseases of darkness." Hippocrates notwithstanding, occidental medicine was really derived from notions of magic and superstition which the wise Greek would have scorned. No few traces of those unscientific—nay, anti-scientific—ideas and practices are to be

found, even to-day, in the methods and the *materia medica* of the modern world.

In the nineteenth century we find a few names of those who may be called the heralds of the dawn. Of these Pioneers, the greatest was Florence Nightingale, who vainly protested, in 1856, against the building of Netley Hospital to offer a pretentious façade to Southampton Water, by excluding all sunlight from the wards. She failed, for once, and the hospital remains. It may be called the last monument of the Dark Ages, but wrongly, for not a few hospitals and schools have since been built

in similar fashion, openly sinning against the Light of Life. Every one to-day knows, however, that hospital authorities of all kinds everywhere are rebuilding, extending, erecting colonies and convalescent homes, with the admission of and access to unpolluted sunlight as their first consideration. Florence Nightingale was the pioneer of this policy in the modern world.

Writing on "Nursing" in Quain's *Dictionary of Medicine*, she declared that "The sun is not only a



C. W. SALEEBY, M.D., F.R.S.E.

painter, he is also a sculptor." Such is genius, which clearly sees with insight what common sight with infinite peering dimly discerns long years after. The sun is not only a painter, making all the colours in the sky, in our meadows and in our lips and cheeks—or all worth looking at—but he is also a sculptor, creating, as we now know, in the living skin receiving his rays that "anti-rachitic" (rickets-curing) vitamin D which builds and moulds the bones, including the jaws and teeth, aright. Under the influence of the sculptor sun, using vitamin D as his magic chisel, which works from within, young bodies are now being built up, notably in Germany, which may fairly be compared for strength and beauty to the

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CHILDREN SUN-BATHING

Every part of the body will benefit by a sun-bath

Apollo Belvedere in the Vatican Gallery and to the noblest and loveliest Venus of Phidias or Praxiteles. Those human sculptors did not create ; they did but record the masterpieces of which the sculptor sun, if we will but let him, is as easily lavish to-day as he was in the age of Pericles.

Without the sculptor sun, children suffer from rickets, "la maladie de l'ombre par excellence," as Dr. Rollier of Leysin calls it. And this brings us to the next great herald of the dawn, the late Dr. T. A. Palm, who contributed to the *Practitioner* in 1890 a masterly paper in which he showed by the geographical study of the disease that lack of sunlight is its essential cause. His great discovery has been abundantly confirmed in the laboratory and on the experimental farm in recent years. Here, briefly summarised, are the proposals with which he concluded his paper thirty-eight years ago ; without the alteration of a comma they constitute the need and the ideal of to-day :—

1. The establishment of means for having systematic and exact records of the sunshine in the heart of our great cities as well as at favourite health resorts. A sunshine recorder at an observatory on some hill-top near a large city is no guide to the amount of sunshine that reaches the streets and alleys of smoky cities. It is im-

portant that the sunshine recorder be of the form which indicates the chemical activity of the sun's rays rather than its heat.

2. The removal of rickety children as early as possible from large towns to a locality where sunshine abounds and the air is dry and bracing.

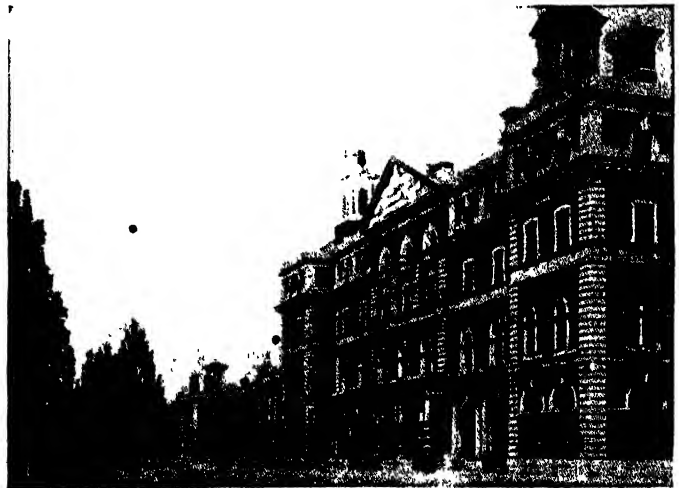
3. The establishment of a sanatorium for poor rickety children in some such locality, in which the severe development of the disease may be averted and much life ar-

health saved by timely treatment.

4. The systematic use of sun-baths as a preventive and therapeutic measure in rickets and other diseases. . . .

6. The direction of the public to the appreciation of sunshine as a means of health. . . . Let people understand that sunshine in the dwelling not only reveals unsuspected dirt, but is Nature's universal disinfectant as well as a stimulant and tonic. Such knowledge will also stimulate efforts for the abatement of smoke and for the multiplication of open spaces, especially as playgrounds for the children of the poor.

It is proper to indicate the scope of the issues here involved. The water-borne diseases, as our grandparents knew them,



NETLEY HOSPITAL

[Underwood

Florence Nightingale vainly protested against the design of this hospital, the windows of which admit very little sunlight to the wards.

THE FOUNDATIONS OF HEALTH

were nothing compared with the diseases of darkness as they are to-day. Rickets, being merely a disease of infancy and childhood, may excite but languid interest in the adult who has no sense of the future, nor of trusteeship for man and destiny. But he may speedily be aroused when, for instance, he is touched in the only sentient organ remaining to him, which is his pocket, by the statement that under our Insurance Act we spend a million pounds a year on sanatoria

But tuberculosis is very far from being the only disease of darkness (and atmospheric dirt) that curses us. In this country our characteristic plagues to-day are air-borne, and attack the air-system, just as the water and food-borne used to attack the food-system. The winter is their opportunity. These respiratory diseases should be recognised as, in a veritable sense, a well-defined entity. At all ages they attack us. For infancy, nowadays, it is the first and not the third trimester that is most dangerous,



OPEN AIR EXERCISE IN GERMANY

[Topical]

Physical culture and outdoor sports have gained tremendous popularity in post-war Germany, and the State has voted millions for their advancement.

for pulmonary tuberculosis in this country, with negligible results—say, according to the best official statistics, fourteen recoveries in a thousand cases.

Tuberculosis is the prince of the powers of darkness. Confident assertions during the past seven years as to its cure and prevention by sunlight, based on the evidence of Dr. Rollier's clinics and school in the sun at Leysin in Switzerland—established respectively in 1903 and 1910—have repeatedly been met with suggestions of exaggeration. Time is proving otherwise.

and one must no longer speak of the "deadly third quarter of the year" as one used to do twenty years ago, but of the deadly first quarter. The elderly are in the same plight as the infantile, and the other ages suffer only in less degree than the very young and the old.

In our vital or mortal statistics, the nature of the facts is obscured by that differential diagnosis and those achievements of bacteriology which, of course, we need and welcome, but which prevent us from seeing the wood for the trees. Thus, having discovered the

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HIPPOCRATES OF COS

The "Father of Medicine" used the Mediterranean sunlight to cure his Athenian patients.

[From *The World's Manuals—The Writers of Greece*. G. G. Norwood (O.U.P.).]

tubercle bacillus, we name a disease tuberculosis, which may attack, for instance, the skin or the lungs; but pulmonary tuberculosis is pulmonary disease. Again, we define pneumonia, but that is also a disease in which a germ attacks the lungs. The air passages leading to the air spaces within the lungs are called bronchi or, when very small, bronchioles. But bronchitis and bronchiolitis and broncho-pneumonia are all diseases of the air-system, and it is proper that, whilst we distinguish, we should also correlate and classify. The total toll from microbic attacks upon the air-system—or respiratory system—is then seen to be stupendous. Nor has the record been here completed, for mention has not been made of coryza, or cold in the head, which may or may not be regarded as an important part of our problem, according as whether or not we are really informed about it. The subject is indeed most important and curious, and can only now be merely named. But add its weight to the burden of our present argument.

The customary figures by no means fully represent the facts, but they are astonishing enough. Here are the most recent figures for England and Wales :—Number of deaths :

bronchitis, 37,786; pneumonia, 38,970; other diseases of respiratory system, 5,857; pulmonary tuberculosis, 32,690. In another form, observe a comparison: malignant disease (cancer and sarcoma), 106 per 1000 deaths; "respiratory diseases," 174 per 1000 deaths, to which add pulmonary tuberculosis, 69 per 1000 deaths. Even to-day, with its extraordinary increase, cancer does not account for anything like half the number of deaths due to respiratory disease. The deaths from measles and whooping cough, which usually kill by secondary infections of the bronchi and lungs, and the deaths attributed to influenza, have not been included. Plainly, our most vulnerable point in this country nowadays is the air-system. We deplore the ravages of tropical disease—yellow fever, sleeping sickness, plague, and so forth; but any one abroad who valued his life and proposed to visit our country might well tremble at the awful risks of death, usually very speedy, which he must run from the respiratory diseases.

It were folly to ignore or underrate bacteriology. All honour to it for its past



FLORENCE NIGHTINGALE

The "Lady with a Lamp"—the pioneer of the sunlight doctrine in the modern world, and the heroine of the work among the sick and wounded in the Crimea.

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and its future, but what about the natural defences of our air passages and lungs? Look at the seasonal incidence of the respiratory diseases, and we realise that the problem is climatic or meteorological. Our bacteriology has frequently obsessed us. Our pharmacology and materia medica in this field are pitifully futile. It is a reproach to medical science that we go on giving this and that cough mixture or expectorant to these cases, and watch them live or die, with impotent and pretentious clinical gestures, whilst the one factor worth mentioning is the

A.
Meteorological
Problem.

are incessant. That is to say, the upper portion of the respiratory tract shows chronic disease, deformity, degeneracy in many forms and in innumerable instances. The larynx precipitates, and clear, resonant, easily-produced speaking and singing voices are so rare that their fortunate possessors are remarked upon wherever they go. How many middle-aged men can laugh heartily for as many as two seconds without a fit of coughing as a *coda*? As for our lungs themselves, we may refrain from comment on the number of chests more or less malformed owing to past rickets, and on the large percentage of



NEW YORK CHILDREN SUN-BATHING

The practice of sun-bathing has gained considerable popularity in America. This illustration shows school children sun-bathing while camping in New Jersey.

nurse who may or not husband and succour the patient's strength. A future generation will be as aghast at the ravages of those diseases and our present complacent unconcern to prevent them as we are at the story of the Great Plague of London or typhoid and typhus fifty years ago.

The actual condition of our respiratory apparatus consorts with the statistical facts of our destruction through this vulnerable area. It is almost true that every one, half the year, has a "snuffle." The interior of the nose is almost rarely normal in adult life. Operations for "tonsils and adenoids"

lungs showing, on autopsy, more or less perfectly healed or quiescent evidence of old tuberculosis lesions; but we should know that, while the infant's lung at birth is pearly white, all our citizen lungs are a dirty grey, infiltrated with coal smoke; a fact of special interest now that the students of industrial hygiene are concerning themselves with the factors, such as dust and other foreign particles, which are so largely found to be the truly underlying causes of tuberculosis and other infections.

Let us ask what is this stuff which we inhale on a typical winter day in any of our

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cities. Atmospheric air is the basis of the mixture, no doubt, but what of dust, soot, tar, dried equine excreta, and the new and noisome products of motor cars, about which latter very much will, ere long, have to be said and done? Is this the breath of life, or poison gas? Though we cannot change our natural climate, and though the new "artificial Riviera," with ultra-violet lamps, etc., to be built in Berlin can never be the equal of the real thing, yet by far the

Our
Atmo-
sphere.

microbes and strengthens our resistance against them. We must restore pure air and light to our cities or surrender the leadership of mankind to other nations, which are now building cities where pure water, clean air, unsullied sunlight, and uncontaminated food will be the common heritage of all their children.

Two Englishmen, Dr. Bownes and Mr. Blunt, showed in the 'seventies that sunlight is an antiseptic, and in 1893 Niels Ryberg Finsen applied it to cure cutaneous tuber-



THE HEALING POWERS OF SUNLIGHT

Little patients lying in the sun at Dr. Rollier's home for the cure of tuberculosis at Leysin, Switzerland.

greater part of the respiratory death-rate is preventable *now*; from now onwards, by means of assured and simple knowledge which already is, or should be, common property—for instance, there is the simple statistical fact of a sudden and monstrous rise in the pulmonary death-rate always following a few days of fog in all our cities.

We must clear our skies. We must restore to our mal-urbanised millions that unique and incomparable antiseptic, the sunlight, which alone both kills disease-producing

culosis in Copenhagen, and in 1900 his fellow-countrywoman, the late Queen Alexandra, then Princess of Wales, brought the Finsen lamp to England; the Princess with the lamp, complementing the work of the "Lady with the lamp" forty years before. Hence there follow all the modern developments of "artificial sunlight," only needing it to be said that to take ourselves and our children out of real sunlight, to neglect and sully that whilst we crowd into artificial

Necessity
for
Sunlight.

THE FOUNDATIONS OF HEALTH



HEALTHY SUN-BABIES

[L.N.A.]

A scene at one of the London day nurseries which receive children while the mothers are at work.

sunlight clinics is an order of thought and practice comparable only to waking your patient in order to give him a sleeping draught.

The real meaning and lesson of heliotherapy is heliohygiene, the goal of all who love health and hate disease—

Smoke Abatement. even curable disease. We must restore the Light of Life to the cities where 80 per cent. of our population lives. We must clean our skies; and the answer to the question of how to do this *now* is Cease to Burn Coal.

There is no real and ultimate solution of our national problem otherwise. The Public Health (Smoke Abatement) Act, 1926, can only be regarded as a miserable triumph to reward the efforts of, for instance, the present writer, who has been protesting against the pollution of the air and the destruction of daylight ever since, as a medical student, he saw a smoke-stained lung in a pathological museum in 1898. The new Act assumes and accepts the burning of

coal and it does not even profess to touch the resultant product in the domestic chimney. It is the considered judgment of those who have observed the facts of the winter 1927-1928, the first during which the Act has been in force, that the abatement of smoke and the increase of sunlight is negligible. That is scarcely to be wondered at, seeing that the author of the Act, Mr. Neville Chamberlain, Minister of Health, him-

self attributed five-sixths of our urban smoke to the domestic chimney.

But the day is dawning. As we have conquered the water-borne diseases by restoring

a pure river of the water of life, to our cities, so we shall abolish the diseases of darkness by restoring to them the Light of Life. And then it will be said, as of old, "The people that walked in darkness have seen a great light, and they that dwell in the land of the shadow of death, upon them hath the light shined."

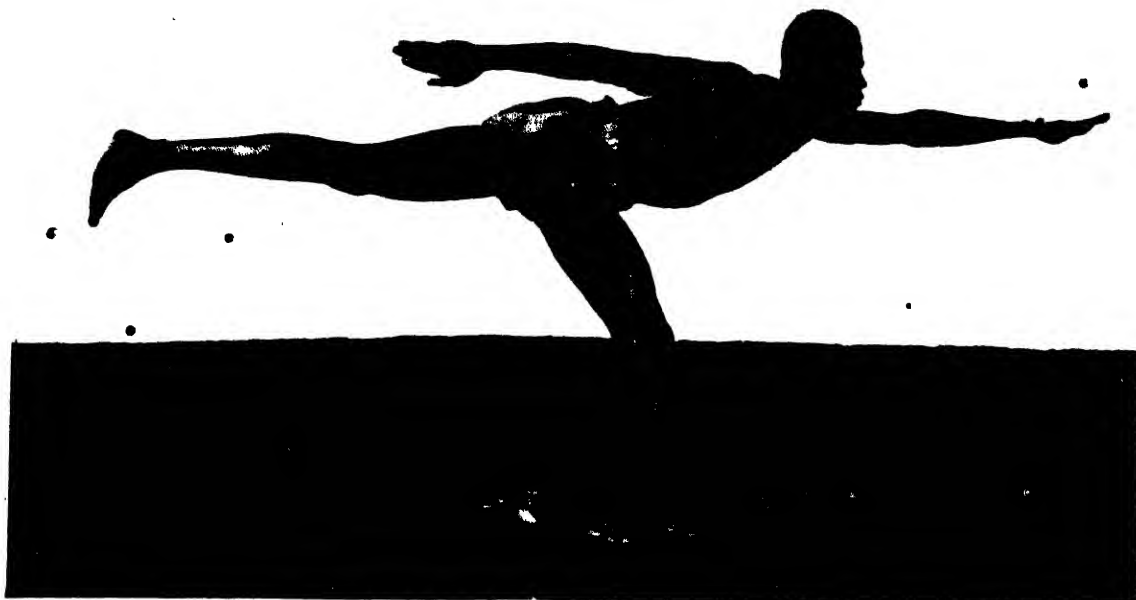
The Future.



[Stewart & Co.]

AN INTERRUPTED SUN-BATH

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[Central Press]

EXERCISE AND HEALTH

By Sir W. ARBUTHNOT LANE, *Eart.*,
C.B., M.S., F.R.C.S.

THE main object of exercise is to keep the body in health. Now health depends, in the first instance, upon the perfect digestion of suitable food, and on the sufficiently rapid transit of the products of digestion through the gastro-intestinal canal, with the automatic evacuation of such material at regular intervals.

It is generally accepted in civilised countries that one action of the bowels a day is sufficient for health, and that the morning is the time best suited for the purpose.

This results from the fact that when the child is very young it is educated to evacuate the bowel only once a day, and usually at some time in the morning.

The native living in a state of nature evacuates the bowel after every meal, since at no period of life is the normal function of the body controlled in an unnatural manner. In consequence of the perfect functioning of the gastro-intestinal tract the native remains free from the acquired troubles incident to a state of civilisation, such as constipation, indigestion, ulcers of the stomach and duodenum, rheumatism, and an incalculable number of diseases, among which cancer is

painfully conspicuous. The native secures this normal habit by eating foods which, besides being nutritious, contain essential vitamins and roughage, which stimulate the intestines to function actively and efficiently. Besides the advantages his diet affords, he supplements its action by such exercises as stimulate the muscles of the lower portion of the trunk with all the viscera contained in it. The dances performed by him are chiefly with the object of developing the muscles in the abdominal wall and in increasing the activity of the muscular wall of the intestine.

If material is permitted to stagnate for twenty-four hours in the large bowel, the liquid components which form a portion of the decomposing and poisonous contents are absorbed, and, becoming more and more solid, the faecal matter ceases to exert the same stimulating action on the muscle wall necessary for its expulsion. Most of us are familiar with the fact that if the bowel is not evacuated when the desire is experienced, it is often impossible or difficult to effect this at a subsequent period.

After studying the mechanism of the exercises which act primarily on the abdomen, the respiratory and circulatory systems call for attention. Partly in consequence of an imperfect digestion and largely because

Waste
Products.

THE FOUNDATIONS OF HEALTH

of the sedentary habits necessitated by our occupations, the perfect functioning of respiration is but rarely performed. Thoracic respiration, or the movements of the chest by means of which air is freely distributed through the lungs and the blood aerated by its intimate contact with oxygen, and the carbonic acid gas expelled by the free ventilation of the small tubes and cells of the lung, is of vital importance to the vitality and health of the individual. Associated with the movement of respiration and the increased oxygenation of the blood, the heart acts normally and effectually, and drives the blood with sufficient rapidity and energy through the entire circulation, so that the extremities are properly warm. If the respiratory function of the chest is performed efficiently the body must be perfectly erect and the abdomen retracted.

If, on the other hand, from the constant assumption of the sitting posture, thoracic respiration gets into abeyance, the chest becomes flattened, the back rounded, and the abdomen prominent.

Efficient Respiration. This produces a vicious circle, which gradually undermines the strength, vitality, mentality, and initiative of the individual. This condition is so common amongst the workers in our cities and so obvious that it does not require to be emphasised further. A man who stoops has

of necessity a poor digestion, is wanting in physical and mental energy, and like a badly-fuelled machine can only do his work badly.

How can this obvious disability be met by exercise? Any one can observe for himself that when he takes the deepest possible inspiration, his spine is extended and erect to the utmost, his chest is full and prominent, the shoulders are held back, and the abdomen is fully retracted. If, on the contrary, the chest be emptied to its utmost, the back is rounded, the head thrown forward, the shoulders depressed, the chest flattened, and the abdomen rendered prominent.

At all times acquire the habit of expanding the chest to the utmost by inspiring as deeply as possible, not only when walking, but also when sitting and lying down. It soon becomes a habit, as the joints and members become more supple.

The purpose of exercise is not for developing large muscles or accomplishing athletic feats, but for attaining what is the ambition of every sensible person :—

1. A graceful, vigorous, and active body.
2. Proper activity of the tissues and organs of the body.
3. Elimination of waste products.
4. A vigorous digestion and the avoidance of constipation.
5. Good sleep and an active brain.



SPEAR-THROWING IN THE ALPS

[G. Brandt, Arosa]

The true aim of exercise should be to build up a graceful, vigorous and active body and to stimulate the tissues and organs to proper activity.

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POSTURE AND HEALTH

By MARGARET MORRIS

CORRECT posture is of the utmost importance to proper growth and health, and the problem that faces all those concerned in the correction of faulty posture is how to change a bad habit into a good one, so that the best position becomes the most comfortable, and therefore the habitual one.

Who cannot remember, as a child, how annoying it was to be constantly told to "hold yourself up," and not to "poke your head forward." Explanations as to the physiological reasons, and warnings as to what will happen to the child if she persists in "poking" her head, or sitting twisted up, are bad, even if not utterly useless, because a child should not be concerned about her health. A normal child never is, and usually has an intense dislike of doing things that are "good for her."

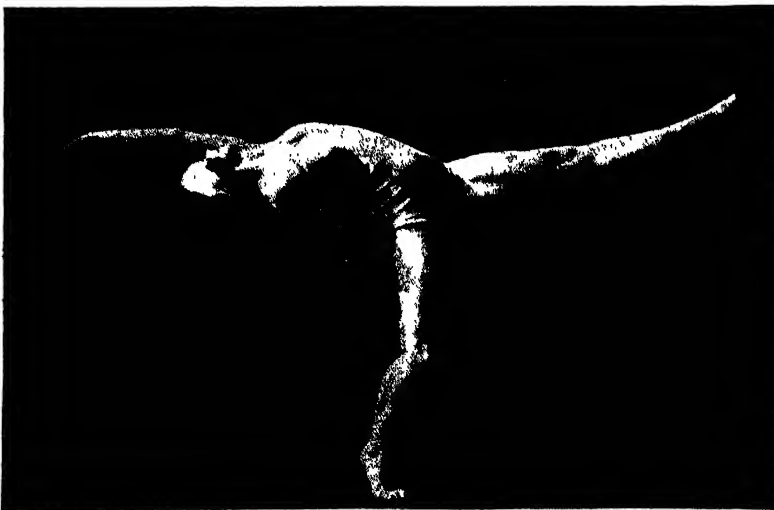
The correction of faulty posture is not a thing that can be done immediately, even with the best will in the world. It is absurd to assume that because a child has been told to "hold herself up" she will remember to do so when her mind is occupied with other things. The cause of faulty posture is usually due to some weakness (the causes

of the weakness may be various), and the bad position, such as one shoulder down, the head dropped forward, the back rounded, is more comfortable than the correct posture, and becomes the habitual one. When the effort is made to assume a good position, it is found uncomfortable, therefore the bad one is resumed.

Though correct posture and walking may be said to be the basis of all physical culture, they have, in most cases, to be arrived at *through* physical exercises. A great deal has been done in the correction of faulty posture by remedial exercise, but if you have ever done remedial exercises as a child, you will remember the utter boredom, even the active dislike of doing them; and I do not think that enough importance has been attached to the question of interest of these exercises.

Nor has it been realised how much better it would be for the child if exercise for general health, or curative purposes, were not given *as such*, but as a form of recreation full of interest and amusement. I think it is now admitted that, whenever the element of boredom is present, the resultant good to be expected from any treatment or exercise is greatly lessened, and that it is not good for the child to be bored.

The Swedish systems of gymnastics and remedial exercises are worked out most soundly from the point of view of anatomy and the analysing and isolating of muscular activity, but they are worked out too much on the assumption that the human body is only a muscular machine. They do not take into consideration sufficiently the human elements that are not visible or tangible, such as likes and dislikes, interest or boredom, and



A DIFFICULT POSE

[Fred Daniels

This difficult balance involves great muscular control, especially of the abdominal muscles.

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they overlook the need for *variety*, and for that *stimulation* of mind and body that can only be arrived at by *active* interest in what is being performed. There is no reason why physical exercise should not be most absorbingly interesting both to children and grown-up people, but the necessity for interest must first be realised, then the way to achieve it must be found.

An interest that can be sustained long enough to develop a good life habit can only be arrived at if the subject in question is capable of creating, and continuing to create, its own interest.

I believe that the solution of the whole problem is to *combine* the medical and artistic points of view. I do not claim that this idea is entirely new, but I believe that full use has not been made of it, and that these two points of view have not yet been combined in a workable method.

Ling had the idea of creating some kind of æsthetic gymnastic, but he did not live long enough to realise it. He, however, thought the artistic side was something to be *added on*, whereas I believe it must be a real *combination* with the medical point of view, growing and developing with it, so that the two supposed to be diametrically opposed points of view find their true relationship.

I have been working at and developing my method along these lines for the past fourteen years. I take the balanced and harmonised development of the body as a basis, and I consider all the movements and positions used from the point of view of composition in form and line, as well as from that of physical development. I have found that an exercise that is well composed for physical development is also the best to look at as a design, and *vice versa*.



[Fred Daniels

A GOOD EXERCISE—AND A GOOD DESIGN

Margaret Morris' pupils demonstrate that exercises well composed for physical development form the best designs.

My experience both with children and grown-up people convinces me how general is the enjoyment of participating in any form of artistic creation. The use that can be made of this appeal in the curing of postural defects, as well as in normal exercise, has certainly been overlooked. I find, too, that personal creative work is of the greatest value for developing the faculties of concentration and construction, and for overcoming self-consciousness.

The use of music and rhythmic beating for ear training and to encourage rhythm in movement is very valuable ; but no exercise should be dependent on the music.

Whenever possible all exercises should be done in the open air. I consider fresh air of so much importance that when it is not possible to have music out of doors, it is better to do without the music.

In conclusion, I have found that physical culture can be made an interesting form of recreation. Classes are taken as an amusement by people of all ages, faults of posture are corrected, muscles built up, and the rhythm and balance of the whole body are developed.

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THE NATION AND HEALTH

By *The Rt. Hon. LORD BUCKMASTER, K.C., P.C.*

ACCORDING to the evidence of geologists, the species of the animal kingdom known as man has existed upon the earth for over five hundred thousand years, and to-day he knows less about what food he ought to eat, when he ought to eat it, and how much he ought to take than the commonest caterpillar that crawls upon a cabbage leaf.

The mass of mankind are pathetically ignorant about the most elementary rules of health, and obey those which are shaped for them partly by tradition, partly by their own inclination, and partly by advertisements of patent medicines and patent foods. It is only within the last few years that it has been discovered that sunlight and fresh air are essential to health, and it is only about fifty or sixty years since we ascertained the remarkable fact that it was better to drink pure water than the unclean contamination of rivers and ponds.

That the knowledge needed by the mass of mankind is possessed by a few is probably true, though the few do not appear to be in complete agreement; but whereas any definite remedy for illness is always freely placed at the disposal of the world, if any distinguished medical man attempts to disseminate knowledge as to food, clothing, and exercise, and gives it the authority of his name, he appears to render himself a suspect by the medical profession. It is always said that the *Index Expurgatorius* in its origin was due to decision by a body of qualified and learned people as to what were the right books to read, and such authority must have been of great value.



[Topical]
THE RT. HON. LORD BUCKMASTER

I have never been able to understand why the great associated medical bodies could not follow this example and themselves issue authoritative statements, as, for example, with regard to the value of brown bread, of unpolished rice, of vegetables and fruits, of the best times for feeding, and the number of meals; and, indeed, proclaim, for those who were anxious to learn, what are the rules which ought to be obeyed if man desires to attain to the happiness of good health. It is, of course, true that people are slow to learn, but they do learn little by little. It is only necessary to notice the open windows when we pass through any country town to-day, and compare them with what would have been seen thirty years ago, to realise that knowledge does spread. Surely, then, the science of a man's body should at least be as well understood as the mechanism of a motor-car.

HEALTH, WEALTH, AND YOUTH

By *the Rt. Hon. T. P. O'CONNOR, P.C., M.P.*

THE more I see of life the more convinced am I that health is the most vital factor to every one born into this world. I see proofs of this view almost every week of my life. I have had the honour during my life, and my wanderings in various parts of the world, of being brought into intimate acquaintance with multimillionaires. On the whole, I have found them an agreeable body of men, with plenty of good feeling, plenty of sympathy, plenty of generosity in coming to the relief of man's estate. I do not know any

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finer character from that point of view than Mr. John D. Rockefeller, Junr. Carnegie also stands out for his magnificent benefactions to good causes. He made a vast amount of money, but he spent it well, and was never tired of spending.

There is one thing which I have frequently found in the possessors of millions, and that is how few of them have perfect health, and accordingly how few have a keen enjoyment of life. To be dyspeptic, or the victim of any other form of chronic physical trouble, is to reduce life to dullness and to sadness. I am convinced that much of this wide-

if every child in every school were taught, as one of its first and most essential studies, the structure of the body, and how to treat it so as to avoid many preventible maladies.

THE WORLD WAR AGAINST DISEASE

By Sir RONALD ROSS, K.C.B., K.C.M.G., F.R.S., D.Sc., M.D., D.P.H., F.R.C.S., etc.,
Director-in-Chief of the Ross Institute and Hospital for Tropical Diseases.

AMONGST the movements to which the British people is unfortunately very often blind is the effort of humanity against the



PHYSICAL CULTURE IN GERMANY

[Topical

A picture taken at Cologne, showing one of the methods by which Germany, recovering from the ravages of the war, is attempting to produce an A 1 nation.

spread evil among the rich (and, of course, among the poor) could be avoided by even a preliminary and slight acquaintance with the organs and the workings of the human frame.

If children were taught even the first and primordial principle of eating slowly, in place of gulping down their food, much of the mental and physical worry of dyspepsia would be avoided. Children in my young days were never taught a single thing about the construction of their bodies and the regulation of their health. I am perfectly sure that an incalculable amount of misery would be avoided if this were changed, and

terrible communicable diseases which destroy so many of them and maim so many others without cessation every year. The public looks upon this matter as being principally "a doctor's affair," and does not even care to talk about it. Yet it is more important to every person in the Empire and in other nations than cricket, football, or even politics, or any other game.

The life of a man is his most important asset, and when we notice that millions of lives are squandered in absurd international conflicts, while millions more are destroyed annually by equally absurd creatures which are too small to be seen, our old-fashioned

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preferences for the ancient gods called Talk and Tongue will begin to wane.

When we look abroad we often find still worse conditions in other countries, especially in the tropics. Malaria and dysentery, plague, cholera, typhoid, yellow fever, and many other maladies are often still allowed to persecute the human race over thousands of square miles; whilst even in England, cancer, tuberculosis, influenza, and that common little disease, often thought to be merely an inconvenience—I mean cold-in-the-head—torment us for the benefit of our invisible and despicable foe.

Seriously, the British public, being segregated from the rest of the world by some leagues of ocean if not by some leagues of wisdom, might set their faces steadily towards an ideal which is probably more likely to benefit us than the success of any political party at the polls. That ideal is to banish all communicable diseases as our politicians (I must say that much for them) have succeeded in banishing hydrophobia. There is this fact to encourage us in such an idea: that communicable diseases tend to become more and more rare in a population which fights them—just as we are assured that another enemy of mankind will cease to trouble us if we resist him. If nothing succeeds like success, nothing fails more than failure. The more rare a communicable disease is, the more rare it will tend to become—like leprosy, which is in a similar case to hydrophobia, and has almost gone from this island, though it still abounds in many other countries. Typhoid also is continuously decreasing, and so is tuberculosis, while plague and cholera find it difficult to get a footing here; and if influenza and colds-in-the-head still murder us to a great extent, it is chiefly because the prevention of these diseases is found to conflict with the dogma of the politician labelled “the liberty of the subject.” If we

could treat persons with influenza and cold-in-the-head like pickpockets and put them into gaol somewhere—say at Westminster—we might learn how to escape these diseases entirely. I am at present engaged on mathematical researches, with Miss H. P. Hudson, on Epidemiology; and it seems to me that epidemics of all diseases are mainly caused by the neglect of the public to make really serious struggles against them. Certainly we talk against them, but when we doctors recommend serious efforts we are generally told that we shall not be allowed to do this or that lest we frighten those priests who manage the worship of the Idol called Liberty of the Subject. Personally, I would rather be deprived of my own liberty than suffer from a cold-in-the-head. But it would be a good thing if other people with colds-in-the-head could be deprived of their liberty to infect me.

It is a pleasure to see that stronger and stronger combined efforts are being made everywhere against communicable diseases. Doctors form societies against them; energetic young men carry on researches regarding them; and even bishops inveigh against them. But we still suffer from want of funds in this war. Our best investigators are often left with nothing but their microscopes and their enthusiasm. It would be a great help if every one now suffering from any communicable disease could be forced to pay some small tax towards reducing the prevalence of that disease. This would not be popular, because all taxes are far from popular, but when the benefits from it would become manifest, the objectors would probably withdraw their opposition.

Did not the inhabitants of Erewhon look upon all diseases as crimes? Certainly the communicable diseases are crimes, not of individuals, but of states.

THE SEVEN AGES OF MAN



MANHOOD

INFANCY

CHILDHOOD

YOUTH

MATURITY

MIDDLE AGE

OLD AGE

II

THE SEVEN AGES OF MAN

INFANCY

By ETHEL BROWNING, M.D., Ch.B., late House Surgeon at the Liverpool Stanley Hospital ; Assistant School Medical Officer for Liverpool and Medical Officer for Garston Infants Welfare Centre.

FROM the time it is born until about two years of age, the human offspring is more helpless than that of any other animal. It is dependent entirely upon the mother, or the mother's substitute, for the very essentials of life—food, warmth, and protection from hurtful influences.

From the very moment of its exit from the shelter of the womb, where it has been automatically fed, warmed, and protected, into the altogether different surroundings of the outside world, the infant is absolutely unable to preserve its own existence without the help of some individual capable of understanding its wants.

There are certain innate peculiarities of structure in the infant body which call for special care and attention, if they are to develop into the adult form without imperfection. The skeleton of the very young child is a much softer structure than the

fully-grown one, and bends easily under pressure. A young baby, therefore, should not be encouraged to sit upright (the spine cannot, in fact, support itself under three months); nor should a heavy child be allowed to walk too soon, for the soft bones of the legs are liable to bend under his weight.

Where there is any tendency to rickets, the risk of deformity from bending is greater, for rickets is a disease in which the "ossification" of the bones is defective. The deposit of lime salts is thickened, but not hardened, so that, though the ends of the bones are enlarged (as in the typical "rickety rosary," or beading of the ribs down each side of the



DR. ETHEL BROWNING

[Russell & Sons]

middle line of the chest), they are not firm enough to stand any pressure or weight without bending.

Recent researches have shown that rickets is due to deficiency of vitamin D, which is built up in the body from foods which con-

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"RICKETY ROSARY"

A disease of the ribs caused by rickets, showing the "beads" formed on the ribs by abnormal deposits of lime salts.

tain it under the influence of the ultra-violet rays of the sun, so that a child which has an adequate diet and plenty of sunlight is not likely to develop rickets.

The presence of rickets is sometimes shown also in an abnormality of the spaces between the bones of the skull, known as the "fontanelles." These are two in number—the anterior, or larger, and the posterior, or smaller. The necessity for protecting a baby's head from injury will be understood when it is realised that only two layers of delicate membrane separate the skin of the scalp from the brain substance itself in these regions. The smaller fontanelle should normally close within the first year, and the larger between the fifteenth and twentieth month; if there is any space left after two years, some abnormality (rickets is the most probable) must be present.

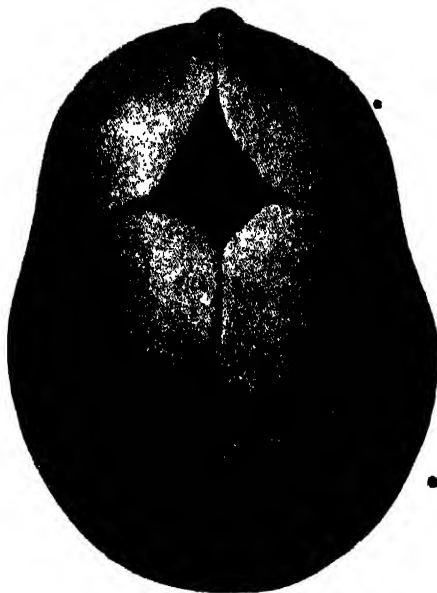
The diet of a baby should be a simple matter if Nature's provision can be made use of. Breast milk, unless the mother has made grave errors of diet, contains all that is essential for the health of the child. It is not necessary for the mother to make strenuous efforts to increase her own diet in order to ensure a

satisfying diet for the child; she must have good, nourishing food, but she need not upset her own digestion by forcing herself to take over-large quantities. She should see that her diet includes foods containing vitamins, which are present in abundance in all fresh fruits, vegetables, salads, milk, and cereals, so that these necessary substances will be transferred to her milk.

But even when the milk itself is perfectly satisfactory, there may be a little difficulty in giving it to the child, and here training and the formation of good habits are entirely in the hands of the mother.

PSYCHOLOGY OF INFANCY

The question of habit in general plays an important part in the normal psychology of infancy. Every mother soon discovers that the formation of good habits is vital both to the child's progress and to her own comfort. Once an activity of any kind is grasped and mastered, it becomes increasingly easy to perform, and in time almost automatic. This fact applies to bad as well as good habits, and the difficulty of breaking a formed bad habit by force or punishment is



THE FONTANELLES

The smaller fontanelle, or space between the bones of the skull, normally close within the first year, the larger between the fifteenth and twentieth month.

THE SEVEN AGES OF MAN

sometimes considerable, resulting in conflict which is bad for the child's character and the mother's peace of mind. It would be better to aim at modification rather than repression in such a case, and instead of peremptorily forbidding a certain activity, to replace it with another. A child must have an outlet for its restless energy, and any occupation which makes a call upon the attention, and requires the employment of

habits is, in his earliest period, not under his own control.

From infancy up to the age of 5 years is the period when the mind of the child develops with greatest rapidity, and an understanding of his mental characteristics is as necessary for directing his mental growth in the right way as a knowledge of the laws of hygiene is necessary for controlling his physical development.



A NURSERY JAZZ BAND

[Keystone

All the children in this band are under five years of age—the period during which the mind develops most quickly.

various muscles, can be used to take the place of undesirable habits.

The beginning of habits in one way or another dates practically from birth, and it lies very much in the hands of parents to see that the education of a child, which is very largely a matter of habit, takes place on the right lines. The health of the future adult is closely linked up with the habits of food, sleep, and general hygiene formed in his childhood, and the inculcation of these

The only defence against discomfort that new-born child possesses is his capacity for crying, and this capacity he exercises from the first possible moment, and continues to use as a method of appeal or protest until he acquires the more intelligible power of speech. A baby may cry from hunger, from pain, from discomfort of any kind (including overfeeding); the deeply implanted instinct of self-preservation urges him un-

Baby's
Method
of Appeal



THE CALL FOR HELP

Crying is for a long time baby's only signal of distress.

consciously to make his discomfort known, and in a very short time he begins to realise that the cry results in the removal of its cause by an ever-ready mother or nurse. Thus, if cared for too assiduously, the child soon learns to cry unnecessarily, and, if the mother yields to the fatal habit of picking him up every time he cries, she not only deprives herself of rest, but the baby also develops a restlessness which leads to sleepless and broken nights.

Certain inherited instincts or tendencies are born in children, and these may be increased or diminished according to the treatment the child receives. Upon these instincts depend the various emotions which sway even the youngest child, and his emotional stability in later life may be greatly influenced by the control which he learns to exercise almost before he is old enough to realise it consciously.

Anger, for instance, which is an offshoot of the instinct of self-preservation, is shown very early in infancy as a response to everything which tends to restrict the movements. Sometimes this reaction, like that of crying,

achieves too easily the object of its desires, and is repeated with a similar purpose until the common state of "temper tantrums" becomes a part of the child's behaviour. On the other hand, the stimulation of anger in the child may be due to over-control, an attempt to direct the behaviour by too much restriction of the natural activity.

Fear is another emotion which can be greatly influenced by the outward circumstances in which the child develops.

Modern psychological

knowledge proves that the normal child is not born with a group of inherited fears of various objects, but that these fears are, to a great extent, instilled into him by the injudicious behaviour of those around him.

The influence of heredity on the future personality is no doubt a strong one, both as regards character and achievements, but it can be modified to a great extent by training and education.

Such a characteristic as shyness or timidity, for example, may be a natural handicap of which the child shows evidence at a very early age, by a reluctance to be taken by anybody but his mother or nurse. The mother of a child of this nature cannot begin too early to accustom him to a change of hands.

The ultimate achievements of the child and adult all have their foundation in the random activities of infancy, which must be controlled and co-ordinated before a human being can learn to fend for himself. The infant kicks and clutches with apparent aimlessness, but his movements have the object

THE SEVEN AGES OF MAN

of attaining what he wants, and gradually he learns to direct them according to some settled plan. The whole of his first year is spent in acquiring some control over these activities, which include those connected with the mechanism of speech, producing inarticulate sounds which gradually develop into intelligible words.

The various soft toys which the baby loves to clutch help him to learn the finer movements of the fingers and to gain some idea of the amount of force needed to grasp such objects. There are so many things with which the growing child has to become familiar, and the extent of his knowledge depends chiefly upon two factors—his previous experience and the condition of his sense organs.

Until he can move about freely in the search for various objects on his own account, all his knowledge of the things around him and their relationship to each other comes to him through the medium of adults, and every object presented to him acquires a meaning according to the way in which it stimulates his sense organs. Thus, a bright ball is recognised by its shape and its brightness, a rattle by the noise that it makes, a woolly toy by the softness of its covering.

The senses are poorly developed in infancy, especially those of sight and hearing, and knowledge of objects grows side by side with their development. Any defect of vision or hearing should be watched for and dealt with as early as possible, because their inadequacy interferes seriously with the gathering of impressions which is an essential process in all mental development.

With regard to sight, the power of converging both eyes to a single point is not possessed by the very young child, and for the first few weeks of life the normal baby therefore appears to squint when looking at any fixed point. At the seventh week, however, the power of convergence has begun to be definitely acquired, to the extent, at any rate, of disappearance of the squint; at four months objects can be followed with the eyes, and at ten months he ought to be able to focus perfectly, the control of the eye muscles being acquired together with that of the other muscular activities of the body taking place during the first year.

The new-born baby cannot hear clearly during the first forty-eight hours of his life; after that he begins to react to certain noises, but not to finer sounds.

When a child has learnt to distinguish objects by their appearance, sound, taste or smell, or touch, he has still to learn their meaning, and as his command of language grows, he can be greatly helped in this respect by having the correct label attached to them by the people around him.



ALL'S RIGHT WITH THE WORLD!

These little twins have discovered that even bathtime can be turned into a jolly game.

[Photopress]



[Ludak Simpson]

CHILDHOOD

(THE EARLY SCHOOL PERIOD)

By *ELIZABETH SLOAN CHESSER, M.D., Ch.B., Lecturer and Examiner for the L.C.C. and the British Red Cross Society.*

THE young child and the adolescent have, during the last ten years, received very necessary attention from parents and all those interested in health and social welfare. Infant clinics and day nurseries have accomplished magnificent results in lowering the mortality rate in young children and in educating the mothers. Articles and books have been devoted to the adolescent; settlement workers and speakers at international congresses have studied delinquency and the provision of better opportunities for the peculiar needs of youths and girls in this era of civilisation.

We have so far neglected the mature child a little, perhaps because the period after second dentition up to puberty is, for parents, one of less anxiety. The child is more stable in physical and mental health and less of a psychological problem than at

almost any other time of life, especially if we provide him with suitable occupation and interests. My own feeling is that, if we studied the young school child and gave proper attention to his requirements, we should go far to prevent ill health of mind and body in later life. It is the stage when the human being is pushing out into the external world, growing away from the home, rapidly developing interests, and with keen perception and sense of adventure. It is the period when health is usually very good, when the boy or girl is full of vitality and zest for play.

Let us consider the physical and mental development of the school child under these headings :—

1. Muscular and skeletal system.
2. Digestive system.
3. Circulatory and respiratory system.
4. Nervous system.

THE SEVEN AGES OF MAN

In the early years the health or disease of the bony structure of the body is of paramount importance. Rickets and tuberculosis of bones must

The Bones and Muscles.

be prevented during the first few years of life. At the period we are for the moment considering the skeleton is in one sense little affected by environment. If the child has contracted rickets in early life, there may be signs of bony changes. The long bones will be bent, there will be nodes at the junctions of cartilage and ribs, and signs of rickets in the skull, especially in the frontal bone or forehead. In less serious cases a flabbiness of the muscles, with spinal curvatures, may be present.

Every child at this stage of life should be examined by the physician twice a year. Standing naked with feet together and arms hanging by the side, spine and shoulder blades and hips will show at once any lack of conformity, any slight abnormality.

Slight spinal curvature and winged scapulae (shoulder blades) are very common and should be corrected as early as possible by complete rest for half an hour daily and by exercises and massage. When curvature is the result of bad habits or of faulty desks, etc., suitable precautions should be taken.

Healthy muscles are almost as important as healthy mindedness. Character, as

Maundsley said, is simply muscle habits. Man is what he does, as well as what he thinks, and conduct, which is the better part of living, is movement, muscle action, muscle tone. Stanley Hall emphasised the importance of motor education, the close relationship between the motor (movement controlling) areas and the psychic life, the fact that muscle culture develops brain-centres. During the pre-pubescent years, the muscular system can be made or marred.

Muscle Culture.



BUILDING STRAIGHT BACKS

(Keystone)

Children performing special exercises for the cure of rickets and spinal trouble at the Swedish Drill College in Stockholm.

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The larger muscles must have free scope for development in games and play, and such pastimes as are associated with nature and sport. At this stage the child's savage instincts should be expressed, not repressed, as may happen in schools of civilised life in towns. Boy Scouts and Girl Guides and similar associations are doing splendid work, because they give the children opportunities for natural healthy enjoyment in the fields and forests, and in camp life close to nature. This is the age in childhood when nature should have a chance and when we must "educate" in the sense of physical training, and in the type of "learning" which requires perception and memory rather than reason, vision, intellect. The child is very amenable to drill and discipline, and learns easily such subjects as history and geography and foreign languages; he has no interest in literature, philosophy, or religion as understood by the adult, and we ought not to expect adult character traits in the child.

What of the smaller muscles which have to do with sight and necessary movements of the hands and face, of speech and of expression? Any one who has studied young people must have observed that these muscles come into good function later than the muscles of locomotion and gesture. Faulty education in the years between 6 and 10 (too little opportunity for use of large muscles, lack of outdoor games, and too much use of the small muscles in sewing, writing, drawing) produces nervous symptoms and nervous habits of nail-biting, face-twitching, winking, snuffling, sucking things, etc. For this reason, long lessons, too much sitting, fixing of attention for too long a period are very dangerous to the school child. "Bad habits" and excessive restlessness are signs of fatigue. Restlessness, however, is at the same time a sign of vitality, the fidgety child requires more opportunity for self-expression and for doing what he wants to do in the way of work and play. The schoolmasters of the future will provide motor tests on the lines of those used for applicants for air pilot

certificates so that children may be helped to good muscle development. The capacity for a given period to hop on one foot, to stand with feet together and eyes shut, to drive in nails, to dress rapidly or perform a series of complicated muscular movements are tests of motor capacity. It is found that those children who are subject to such automatisms as stammering, tics, nail-biting, are less adept, less successful in their muscle responses. The outlook is hopeful in proportion as we organise judicious training of the larger muscles in childhood by games, dancing, swimming, eurythmics.

The digestive system is exposed to fewer perils between the ages of 8 and 14 than at almost any other period of life.

The Digestive System. The second dentition, with its liability to physical disturbances, is over, the uncertain appetites of adolescence belong to the future, the mature child eats well, digests easily, and is not very liable to constipation or intestinal disturbances. Such disorders as appendicitis may of course appear, and a child who is liable to abdominal pain and "liver attacks" should be examined by a doctor, as "grumbling appendix" is a possible cause, which it is dangerous to neglect.

The school child should have three good meals a day—breakfast, dinner, and tea-supper. The last meal should not consist only of bread and butter and tea, but fish, cheese dishes, or eggs and salads, and fruit should be included. The child is growing rapidly and must be well fed, and two essential articles of diet are milk and green vegetables. The teeth, as a part of the digestive system, should be regularly examined, and necessary stoppings and extractions attended to. Good habits in connection with the excretory system should be established, so that the bowels are well moved at least twice daily. The child takes a warm bath and tepid sponge once in twenty-four hours to keep the skin active, and the kidneys are assisted by one or two tumblers of water or fresh lemonade between meals.

To ensure a healthy circulatory and

THE SEVEN AGES OF MAN



CAN YOU DO THIS?

The pose of this little dancer is the result of careful training at the age when the joints and muscles are most pliant.

[Topical



THE PUGNACIOUS INSTINCT

Lack of boxing gloves does not deter these young pugilists.

organs and muscles, and the brain especially suffers if there are not sufficient red blood cells, and if the calcium and iron content is below normal. In these cases, nourishing diet, together with some form of iron and sun-baths will make all the difference to the health and vitality of the child, and to its physical and mental development.

The brain of the school child is almost the size of the adult brain; the nervous system is comparatively stable. The

respiratory system during the school age, the first requirement is ample fresh air day and night. Let children be accustomed to breathing cold, pure air, and there will be less tendency to colds and catarrhs, enlarged tonsils and adenoids. Such signs of nasal obstruction as mouth-breathing and night-snoring should be investigated by the physician. Children who are liable to chilblains can be saved hours of suffering by proper diet and the administration of certain glandular extracts. Exercise in the form of games and dancing improves any existing weakness of the circulation, and skipping and gymnastic exercises develop the lungs and chest. It is a good plan to make regular measurement of the chest at the nipple line (1) in deep expiration, (2) in deep inspiration, and note the improvement in chest expansion after a course of deep breathing and chest exercises, and a regimen of fresh air day and night.

When children suffer from anaemia, the blood should not be neglected, with the erroneous idea that they will "grow out of it." Poor blood means poor nourishment of

child's reactions are rapid and vigorous. It is a time of nervous calm and quiet compared with what exists after puberty, when growth of mind and body is rapidly accelerated, often in association with instability, both physical and psychical. At this—comparatively—sexless period of life, girls can take part in the same games, and even excel boys of the same age in physical and mental competition. Mental development is not usually parallel with bodily growth. Indeed a child who grows too fast is apt to suffer such mental signs of fatigue as lassitude and lack of interest in lessons. Children seem to grow in spurts, to pass from a period of mental dullness to alert-mindedness, and *vice versa*. After infectious diseases, often for as long a period as eighteen months, the brain is tired, and the child feels it difficult to compete with others of the same age.

Further, children are sometimes called mentally slow because they have some defect of the senses, such as short sight, or deafness, or they may lack interest in one or other subject. Some teachers have the power of

Mental Development.

Capacity for Learning.

THE SEVEN AGES OF MAN

destroying the interest of certain types of children, whilst others succeed in drawing forth latent capacity and ability. It has been observed that many children cannot learn easily through the eyes, they do not understand through *reading* a subject, but they are very quick in auditory appreciation. If some one explains scientific facts and demonstrates in the laboratory, they learn eagerly and rapidly. They may be good students of diagrams and maps, but the written word makes little appeal. Such children, if misunderstood, are wrongly considered lacking in intelligence. In studying children, we must not forget that there are many different types of intelligence. One of our most brilliant and admired generals in the last war was a poor scholar, never able to pass into the fifth form. A girl who dislikes mathematics may be a fine artist or physician; a boy who hates lessons may excel in writing themes. We can help school children enormously by giving them encouragement and scope to do the work they enjoy, whilst pointing out the necessity for the achievement of a decent all-round standard of education. Shorter lessons, opportunity for relaxation and effort to arouse the child's interest will help to promote that attention and concentration which makes children *like* work. If that is not achieved between 8 and 14 years, a child's attitude to work is permanently affected to the detriment of his—or her—whole career.

From infancy to maturity the human being passes through various stages, from the selfish or "ego-centric" to that regard

for other people which may be called altruistic. The crude primitive instincts have to be controlled by the intelligence, good sentiments, and good habits acquired, and "will" the servant, and "character" the quality of the self are gradually achieved. Every student of psychology realises the truth of Herbert Spencer's maxim that the child's development is comparable to the development of the human race. Between 8 and 14 he is at the stage of what was maturity in our paleolithic ancestors. He loves fighting and hunting and roving; he reads stories of adventure, and the detective story with a hero-villain flavour makes a special appeal. Civilisation compels him to sit in a school-room and learn algebra when his nature is longing for idleness, combined with sporting life in the open. He may rebel and play truant, or he may escape from reality through fantasy and dreams of being a pirate king. Just before puberty, indeed, at what is called the "Gang" stage, boys will often organise themselves into groups, their conduct verging into delinquency and

Psycho-
logical
Develop-
ment.



MERRY LITTLE HAYMAKERS

(L'Espresso)

An ideal form of open-air recreation which exercises the limbs and provides plenty of fun.

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(Central Press)

WHO SAID NERVES?

Outdoor games and exercises for the large muscles of the limbs and trunk are the best prevention for the nervous symptoms which appear in so many children.

youthful criminality. Psychological development is hindered, and criminals manufactured, unless we can give children scope to live each stage of life completely. In the early years a certain measure of aggressiveness and self-importance must be conceded and curiosity satisfied, curiosity about sex especially.

In the stage we are considering, that of the mature child, the instinct of pugnacity and other more or less savage instincts must also be allowed scope. The craving to rove or wander, the desire for personal independence—all these must be understood, if we are to help the child. Schools of the future, through new and rapid methods of transit (by airships, perhaps), will provide in the country natural occupations and interests. A part of the school year will be spent in camps and country settlements. Groups of children will learn architecture, plumbing, house decoration, carpentry, *by making and*

building with their own hands. There will be opportunity for self-expression, and at the same time education and practical accomplishment, and children will be happier and better.

There is a vast amount of preventible suffering amongst children to-day. Wrong methods produce inhibitions and repressions. Children are not helped to pass naturally from one psychological stage to the next, and so we see infantile traits (greed, selfishness, cruelty) amongst men and women everywhere. A free and happy and well-disciplined childhood is a wonderful and rare experience, but it is the heritage and right of the child. It will help him to pass the difficult years of adolescence and make his maturity a time of vigorous work and effort, and he will enjoy life physically and mentally. Satisfactory sublimation of instinctive energy is essential for health and

**The
Child's
Heritage.**

THE SEVEN AGES OF MAN

happiness. In play and muscular activity, sublimation is naturally provided at the school-child age. The child who has healthy outlets is less likely to suffer from arrested emotional development, one sign of which is the prevalence of fears and phobias amongst grown-ups who are still

children in their attitude to life. Normal psychological development helps men and women to live a happy emotional life, either in marriage with the wise care of children, or, if unmarried, to sublimate in friendship and work and ideals of service.

ADOLESCENCE

THE ADOLESCENT BOY

By **C. STANFORD READ, M.D., M.R.C.S., L.R.C.P.**, *Lecturer in Medical Psychology at the Bethlem Royal Hospital; Author of "The Struggle of Male Adolescence."*

THOUGH the early period of childhood is the stage in which the foundations are laid for the future well-being of manhood, it is during adolescence that real character formation takes place. So much then depends upon the various influences to which the youth is subjected and upon whether the great emotional forces within him are guided into the right channels. It is too often assumed that development will proceed naturally and satisfactorily without any parental knowledge of the factors that insidiously are moulding it for good or for ill. Bodily care receives due attention, but the mind is supposed to look after itself. The progress of medicine is ever towards prevention, and in dealing with the manifold troubles that have their source in the mind we are coming to realise more and more that they would never have arisen, if only early training had been on right lines.

Through enlightenment on the mental hygiene of youth, parents can materially pave the way towards their son's future happiness and tend to obviate the varied forms of unhealthy reactions that may otherwise arise when he meets the inevitable strains and stresses of life.

At adolescence there are profound mental changes, and the body, too, is modified at the same time. The boy now gradually gives up his childish interests and begins to look ahead.

He begins to develop an individuality and a growing self-consciousness. An independent spirit and the formation of

his own opinions tend to lead to an egoism which is naturally at times excessive. The interests greatly widen and are sought outside the home circle. Ideals dawn and conscientious feelings of right and wrong will go hand in hand with a budding ethical and religious self. Old instincts are modified, and new powers are felt which cause wonderment and curiosity. The sex impulses take on an adult colouring and are highly apt to cause mental conflicts of which the



DR. STANFORD READ

[Elliott & Fry]

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[Courtesy]

A CAMP GAME

[Boy Scouts' Association]

parents are quite ignorant because the subject unfortunately is one which is regarded as shameful and not to be spoken about, even among intimates. Much of the future healthy-mindedness of the boy will depend upon his experiences and education in this sphere. It is now that the interest in the opposite sex becomes apparent and accompanied perhaps by awe and a fear of the newly-born promptings that beset him. As the social instincts come into life, strong friendships are made, and since the imitative faculty is now at its height, these human influences are of vast import. The intellect now tends to find its real worth, but whether its capacity works smoothly or not depends much upon the harmonious functioning of the emotions which at this period are so liable to be at variance. Want of progress in school studies frequently has its source in little suspected undercurrents of feeling of inferiority, jealousy, injustice, or resentment. The finishing touches are being put upon character, and let us disabuse our minds once and for ever that any undesirable and unhealthy characteristics will be grown out of. They may alter or even temporarily disappear, but unless they are duly recognised and their foundations adjusted, they will again appear in adult life when occasion calls them forth.

We must bear in mind, then, that adolescence is a very vital period of life. The youth is

throwing off the shackles of dependence upon narrow home associations and entering upon what to him is a new world. Temperaments and mental dispositions will differ greatly, and some will find the battle much harder than others. Parents must increasingly recognise that they should educate themselves to understand the many distorting influences to which he may be subjected.

Let us briefly sketch out the main factors that are of importance to know of in this respect. The great bulk of these lies in the emotional effects of home life. As a boy grows up and faces the world, his feelings and actions towards others can only be more or less on similar lines to those to which he was habituated in relation to his parents and brothers and sisters. The mother and all that she involves, stands forth as the paramount factor in a boy's life. It is through her that his tenderest feelings are aroused, and grow. The foundations of his future love-life centre round the bond between them. Since babyhood his dependence on her is so great that there is the constant danger of an undue emotional attachment being formed which may have far-reaching and undesirable results. If the mother be too lavish in her affection, she tends to nurture a love-craving which, in later years, can find no satisfaction. Her exaggerated

The Main Factors.



[Courtesy]

BOY SCOUTS ON TREK

[Boy Scouts' Association]

THE SEVEN AGES OF MAN

solicitation for his welfare, and her constant warnings about danger and ill health, may breed morbid fears and a childish attitude to life which ill prepares him for manhood.

The adolescent boy thus grows up nervous, lacking self-confidence and a proper spirit of independence. The so-called "mother's boy" is ill adapted to undertake the responsibilities of the man, and commonly breaks down under the strain. The favourite or the only boy runs this danger more than

boys who are thus bound to their youthful environment are likely to suffer from homesickness on leaving the parental roof, or, on the other hand, in unconsciously trying to escape from their bondage, to develop truancy or a wandering mania which they, or others, cannot understand. Going to the opposite extreme, lack of love may be disastrous to the adolescent. He may feel an unquenchable thirst for what he never has and seek it in undesirable channels.



OFF FOR THE HOLIDAYS

(Keystone)

Celebrating a joyous occasion in characteristic fashion.

others. An unhappy atmosphere existing between parents insidiously affects the adolescent boy to his detriment. It usually means an exaggerated affection from one and neglect by the other. Excessive mother-attachment is a fruitful cause of difficulties in the adult love-life and nervous breakdowns on engagement or marriage. In all later love the maternal image is sought. There is no freedom to love naturally, and either disappointments come about or lifelong bachelordom results. Those

or he may grow up with a bitter resentment against his parents for not giving him what he naturally considers is his right. There is also the great tendency for him to feel the lack of sympathy and to become consequently self-centred, with all its attendant dangers.

The father may, in many unrecognised ways, harmfully affect his adolescent son. It may be that he is an individual who has an exaggerated longing for affection, and cannot help feeling jealous of the love

Dangers
of Dis-
harmony.



[Sport & General]

THE VIGOUR OF YOUTH

A coming champion makes no mistake with his drive at North Foreland.

the boy receives from his mother. This attitude, which is not so uncommon as may be supposed, is very probably but thinly disguised. The son, on his part, is apt to feel he is not wanted. Another jealousy of the father may be that of his boy's growing powers and capacities while his own are diminishing. These feelings, if existent, will be calculated to lead to undue and severe repressive measures for which, quite unconsciously, quite other reasons are adduced. This parent may already be too self-assertive, and it is by such means that that bugbear of adolescence, a sense of inferiority, is brought about. The boy has thereby his initiative dulled, and develops an exaggerated subservieney to all authority unless a rankling feeling of injustice causes reactions of revolt. When the father is

too severe, the mother is liable to compensate in the other direction, though she, of course, may err on the authoritative side. At the same time too much may be expected of the boy, and because he cannot fulfil the parents' ambitions, his inferiority feelings become still more heightened, with consequent mental suffering. As the attitude is to the parents, so will there be the tendency to develop the same reactions to the other members of the family. The elder sister will represent the mother, and the elder brother the father. If there is emotional dis-harmony in the home, there may develop jealousies and hatreds amongst the children which will militate greatly against good character formation. Much will depend upon how much the boy's interests clash with those of the others. A bullying elder brother may work havoc in begetting a sense of inferiority, but if, through the difference of age, any such conflict is reduced to a minimum, no untoward effects are likely to accrue.

We have seen that in the mental hygiene of the adolescent boy, his greatest dangers lie in the warping of his emotional feelings and impulses through injudicious training or discordant influences in the home circle.

The school fulfils a highly important mental function in that it is a step away from parent dependency and so towards individuality. Authority, however, is only transferred to a substitute, and the boy will show the same type of reactions at school as he did at home. Doing badly at school is another factor productive of a sense of inferiority. In any circumstances there is always the tendency for the youngster to be torn between his desire to assert himself and his feeling of helplessness in a new world. Any factor that adds to the latter is very handicapping to successful development. As an attempt to compensate for his weakness, an air of cocksureness is not infrequently assumed.

There is another compensation for disappointments in life to which the adolescent is highly prone. This is day-dreaming,



THE SEVEN AGES OF MAN

which is a normal enough process at this period, but if unduly indulged in is an indication of a morbid tendency.

Day-Dreaming. It is natural that the boy's instinctive cravings, mingling with a hazy vision of a future life of adulthood, should tend to make him weave fantasies of wonderful possibilities. Given, however, obstacles in the path of his emotional gratifications, he may constantly be seeking solitude in order to revel in the land of make-believe. Normally, the day-dream of imagination should be constructive and stimulate to act in such a way that the castles in the air may become reality. Merely imagining a wish is gratified without striving towards its realisation is a destructive process and a waste of time. For the adolescent to live much in a world of his own means that he is losing touch with the real one.

Of the many conflicts which may worry the adolescent boy and cause symptoms of ill health, sexual troubles are highly important. The urges of the sexual instinct, previously unknown to him, create wonder, curiosity, and perhaps fear. Since he commonly receives no understanding enlightenment from the proper quarter, he greedily picks up knowledge from undesirable sources. Realising that the subject is taboo, he is likely to regard all sexual thoughts and manifestations as sinful and vicious. In the vast majority of instances masturbation is indulged in for a varying period. This must be looked upon as almost a normal phase of sexual development in adolescence, and there is no reason to suppose that any physical or mental injury will result in the absence of great excess or the fears that are implanted by others who, with the best intentions, are ignorant of sexual hygiene. It is because the boy is taught that masturbation is a perverse and wicked habit, and that harm will inevitably ensue if it is continued, that the act is preceded by a mental struggle and followed by remorse and depression. In a healthy lad this temporary sexual practice need cause no

worry. In exceptional and morbid types it may become an important problem, requiring investigation and expert advice.

If we sum up the practical aspects of the Emancipation of the adolescent boy, we have in the main to recognise that his welfare is inextricably related to the parental bond and the atmosphere of the home. Though heredity must have its effects, the influences of later environment are highly of consequence. The parents' emotional attitude towards each other and towards their son are the prime factors in his healthy development. Too much love or lack of it on the mother's part is a frequent source of unwholesome trends. Undue repressive measures by the father tend to arouse feelings of inferiority which, if they persist,



HEALTHY ADOLESCENCE

R. Ritchie, son of the famous tennis player, keeps his eye on the ball.

[Sport & General

THE GOLDEN HEALTH LIBRARY

are a life-long handicap. These may, on the other hand, bring about a revolt against all authority which perhaps leads to lying, delinquency, and various forms of anti-social conduct. Much trouble in adolescent life would be obviated if confidential talks between parents and the boy were made easy. In them an outlet would be found for the expression of his inmost joys and fears and desires. Undue repression is thus avoided, and the personality can expand naturally. It must be realised that the great developmental aims in adolescence are those of emancipation from exaggerated family attachments, the gaining of an individual personality, being free to love objects outside the family circle, and to will and act without slavish subserviency to home influences. Parents must gradually lessen their authoritative hold and encourage self-confidence and the shouldering of responsibilities. There must be no attempt to mould the boy into a particular type. Education must consist in drawing out the potentialities within and not implanting something from without. If the emotional life is satisfactory, the intellect will develop normally by itself. The facts of sex, from an adult point of view, should be imparted. Sex knowledge and a healthy attitude towards it will save the adolescent boy from the many pitfalls that beset him in this sphere. The father should be the boy's best friend and mentor. No stern or repressive measures should be adopted, no harmful fears instilled, but only a frank talk, without any atmosphere of shame or sin. Mutual and sincere confidence between father and son will go very far to ease or prevent the disturbances of the inner life from which adolescence

is liable to suffer. Difficult and exceptional types of boys are now and again met with. These will necessitate particular and careful handling and very likely the assistance of expert advice. With the average boy, his successful upbringing depends mainly on the factors here dealt with.

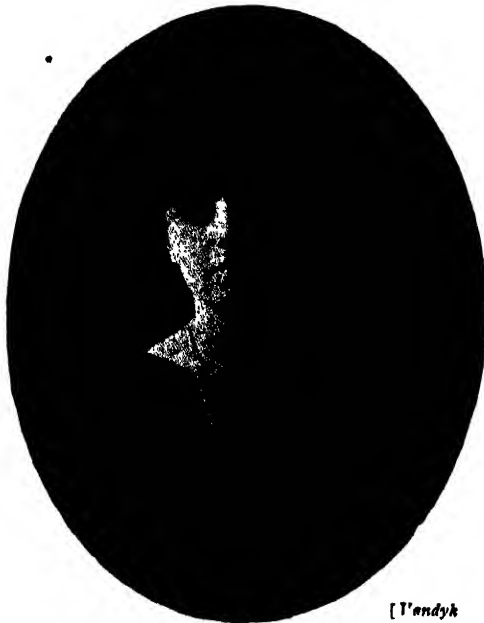
THE ADOLESCENT GIRL

By **BARBARA G. R. CRAWFORD, M.B.E., M.B., Ch.B.**, late Senior Resident Medical Officer at the Borough Isolation Hospital and Sanatorium, Leicester.

In some ways a girl is even more hardy than her brothers; as a baby, she survives the ordeal of birth better, partly, no doubt, on account of her somewhat smaller size. She is less liable to certain hereditary diseases and defects, such as haemophilia (bleeding). A girl baby is much less liable to ruptures, and she also resists many diseases better than a boy does. In spite of the special dangers of pregnancy and childbirth which womanhood brings her, woman has an expectation of life longer by about five years than man's.

The popular idea that girls are more "delicate" than boys arose from the obvious facts of their smaller frames and comparative muscular weakness, but this does not in any way imply feebleness of health or liability to disease.

With some southern races development is much earlier than in the North, and a girl as soon as puberty is reached is considered mature and marriageable; but among the more northern races development is slower and more gradual, and a girl is not considered fit for marriage and maternity until her growth is com-



DR. BARBARA CRAWFORD

[Tandyk]

THE SEVEN AGES OF MAN

pleted many years later. This slowness of development is no disadvantage, but quite the contrary, for maturity lasts longer, and old age is much deferred.

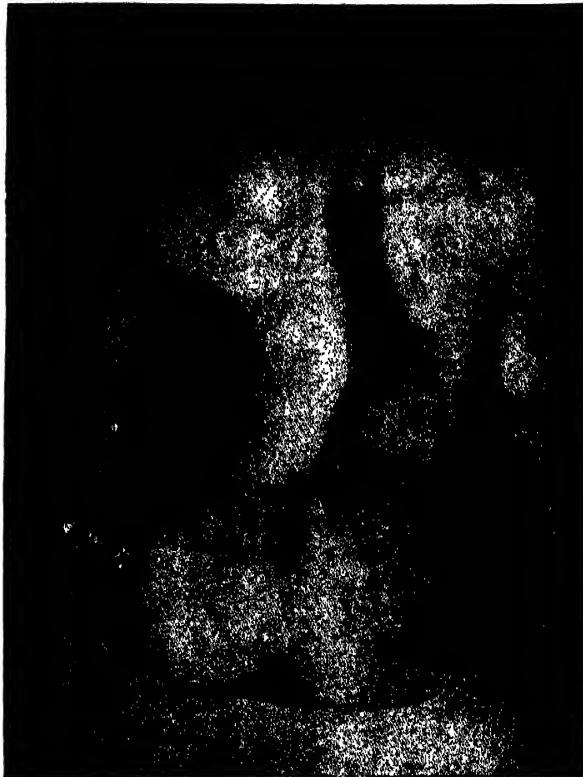
At puberty the reproductive organs

become
The capable
Menstrual Function.

of their functions, the breasts fill out, and the womb takes on the monthly cycle which continues, except during periods of child-bearing, all through maturity, until fertility declines in middle age. As these newly-functioning organs demand vital energy for their

development, it is only a matter of common sense not to press a girl unduly with her studies at this age, nor to allow her to exhaust herself with games. Moderation in both is the way to health. To coddle or allow a girl to think herself an invalid when the menstrual flow appears would be the one extreme of foolishness, but to allow her to compete to exhaustion in studies or sports at a time when special calls are being made on her strength is even more wrong. In most cases a girl can follow her usual routine during the period, but all violent exercise should be avoided, and sports, such as swimming, must of course be given up for the time.

If the flow is very copious, as it occasionally is at the beginning, in consideration of the physical inconvenience it causes, a day's holiday may be a wise measure, and if there is pain, to rest for an hour or two



Courtesy]

["Manual of Surgery," by A. Thomson & A. Miles

ADOLESCENT SCOLIOSIS IN A GIRL

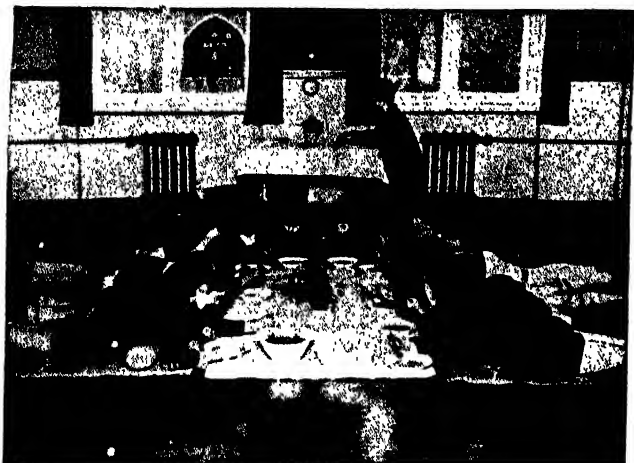
Scoliosis, or lateral curvature of the spine, may show itself in an adolescent girl in a number of ways, such as a protruding shoulder-blade and a habit of sitting or walking badly.

it is due to some more serious cause. In any case, where pain persists or is troublesome, medical advice must be obtained.

There is one cause of trouble which, though rare, must be mentioned; that is, an imperforate hymen. The hymen (or maidenhead, as it is sometimes called) is a circular fold of membrane which partially closes the opening of the vaginal passage in a child or unmarried girl. Normally there is a sufficient central opening, and the membrane is usually stretched and torn on the first occasion of married intercourse. Sometimes it is unduly tough, or may even have no central opening. In such a case, when menstruation commences the flow takes place from the womb, but cannot escape from the passage, and, if not relieved, will cause pain and swelling and other symptoms of distress and illness. If a girl

with a hot-water bottle or other comforting source of warmth to the abdomen will often bring relief. A mild aperient taken when the period is due is a valuable preventive of both these troubles, and constipation must at all times be most carefully avoided. In many cases, pain is due to the congestion and increased blood supply to the womb before the flow sets in to relieve it, or perhaps to the mouth of the womb being too firmly closed to allow free exit to the flow. It usually disappears soon after the flow is established, unless

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A CURE FOR SPINAL CURVATURE

Treatment for spinal curvature includes rest and systematic exercises. The lunch hour at a school where children, with defective spines, eat and learn lying down.

(Topical

about the age of puberty has attacks of pain and little or no flow, she should at once be examined by a doctor, who will find out if all is normal, or if some condition such as that described requires correction.

No girl should be allowed to reach the age of puberty without knowledge of the important change she is to ex-

perience; and the right person to give this instruction is her mother; or, preferably, since the

explanation sometimes causes a feeling of constraint in a sensitive girl, some experienced woman teacher or doctor. These explanations should always be given privately and individually. Details as to what a child may expect in her own person are quite unsuitable for class instruction, though general knowledge on the subject of sex may quite well be so given as part of the wider subjects of biology, physiology, and hygiene.

Adolescence is a time of great activity, and a healthy girl often

Hygiene of Adolescence. regards a quiet hour as one that has been wasted, but if she is overworked or strained at this period of development, even if she avoids immediate breakdown, her stamina

and constitution will be weakened, and strong and healthy womanhood may be forfeited. A girl should not be reproved for laziness when the cause of her unwillingness to work is really tiredness. At this age she needs much rest, much food, and much sleep—nine hours is not too much for her, and late hours are specially to be avoided.

Sometimes at this age or earlier, muscular weakness may show itself in the form of spinal curvature. The slightest indications of this should be noticed at once. These include a tendency to hold one hip or shoulder higher than the other, to walk badly, stand or sit bent over in a "round-shouldered" position,

or for one shoulder-blade to "stick out" more than the other—this last is a valuable sign. With proper treatment begun early these curvatures are quite curable, but they must be treated seriously under a doctor's advice, usually by rest and systematic exercises over a long period.

The diet of the growing girl needs supervision. At this stage of her life she requires fully as much, or even more food, than an adult woman, and it must be such as will build up and preserve healthy functioning of



Courtesy)

(Madonna Training College, Leicestershire)

THE NURSERY GOVERNESS IN THE MAKING

One of the many careers open to a home-loving girl which will develop her gifts and provide her with a congenial livelihood.

THE SEVEN AGES OF MAN

all the organs of the body. Fruit should form an important item of the daily diet, for besides containing the vitamins essential to growth and health, it is excellent for helping to preserve the teeth and to regulate the bowels. If fresh fruit is difficult to obtain (in the winter months), raisins and sultanas, figs and prunes, form good substitutes, and fortunately the orange is always obtainable then. Meat once a day is enough, and eggs and fish are valuable alternatives to it. Milk, butter, and green vegetables and salads should be unstinted, and the value of wholemeal bread has been well proved.

planned. After 16 years of age experience comes, but intelligence does not increase except with a small minority.

The Adolescent Mind. No new ability will arise, though industry and application may enormously develop those already there. If she is not musical or artistic, quick at figures, clever with her hands, or gifted at languages at 16 she never will be, so do not waste time teaching a girl of little talent to play the piano or to sing, or to draw, or force one not eager for study through a university course.

It is best to find out what talents she has,



READY FOR A GALLOP

[Keystone]

Riding is one of the finest forms of healthy exercise.

Regular habits as regards movements of the bowels should be taught from infancy, and are absolutely essential for healthy activity of body and mind.

Purgatives are to be avoided, and will not be needed if regular and sufficient time is given to this important function, if fresh food is eaten containing the roughage which is Nature's own intestinal stimulant, and if plenty of water is taken between meals.

As regards the mind of the adolescent girl—all her talents and faculties are now developed, if not in full maturity, sufficiently to allow of her future being

and in very many cases what she *likes* is the index to her abilities, and train her along those lines. It is hardly necessary to advise parents nowadays to let a brilliant girl follow the career she chooses; it is rather needful to beg them not to force a home-loving or child-loving girl into an uncongenial business or profession. There are many openings which she can fill in domestic science, catering, cookery, kindergarten work, nursing, etc., and such training will help her to success if she should later on devote herself to the most important vocation of motherhood.



THE WRESTLERS

[Brong.]

An ancient marble group in the Uffizi Gallery, Florence, representing splendid types of Greek manhood.

MATURITY

MANHOOD

By **LEONARD L. B. WILLIAMS, M.D.**,
*Physician to the Legal and General Assurance
Society; late Physician to the Miller Hospital,
Greenwich.*

WHEN the imperceptible transition from late adolescence to full maturity has been safely accomplished, the young man becomes an independent self-supporting entity. It is soon brought home to him that the freedom from outside control which he now enjoys for the first time is accompanied by certain responsibilities, and the pleasant sense of freedom is very soon overborne by the weight of new and ever-increasing obligations. It is probably true to say that the majority of young men in this country enter upon their period of maturity with a certain measure of the so-called inferiority complex, which many of them seek sub-

Self-
Confidence
Essential.

consciously to conceal behind an exaggerated assumption of superiority. Than a pronounced degree of the inferiority complex, unrecognised, there is no more formidable handicap to success in life. Wise and sympathetic treatment at the stage of early maturity is in most cases quite sufficient to correct it; the trouble is, however, that the condition very often goes unrecognised, especially as the victim's protective colouring is usually very impenetrable. The sense of inferiority, when present, may reveal itself in various ways, chiefly social, but the direction in which its handicap is most seriously manifest is when the victim conceals, beneath his aggressive manner, an utter inability to accept responsibility. Accustomed to the support and direction of parents, pastors, masters, and tutors—when he finds that he is expected to carry his own cross unaided, he breaks down,

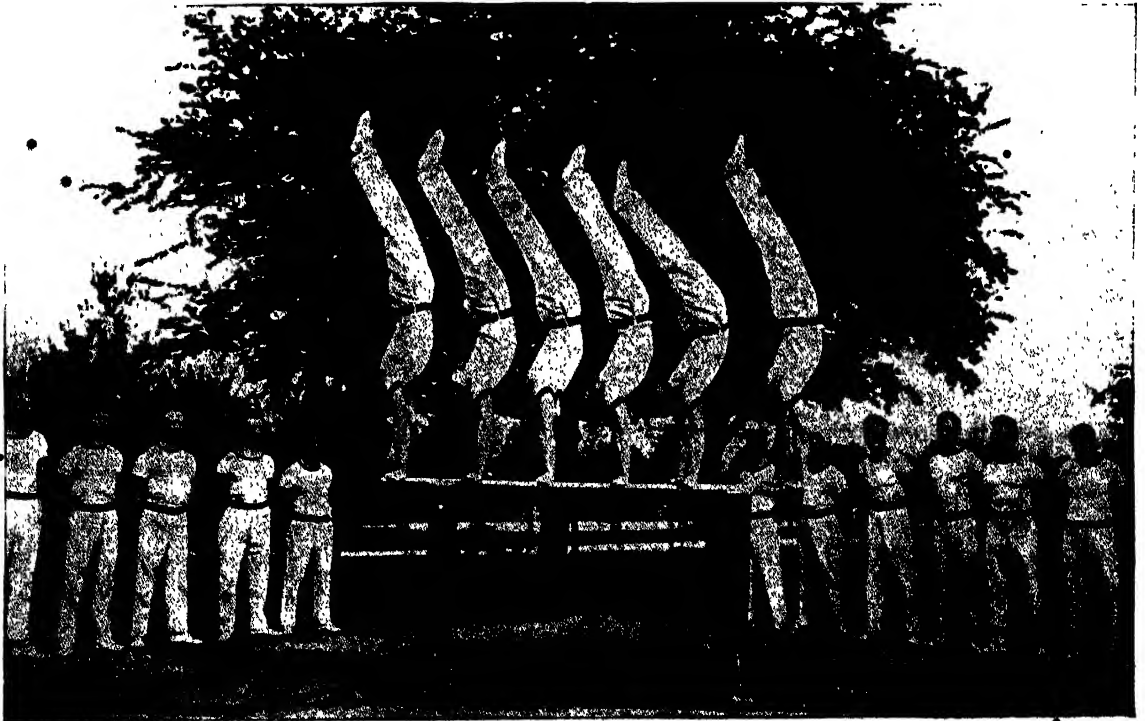
THE SEVEN AGES OF MAN

and, despite his education for leadership, he becomes relegated for life to the ranks of the underlings. Every endeavour should be made to give young men the right kind of self-confidence. Some callings, notably the Church and the Bar, do this automatically; in most others the confidence comes by very slow degrees: indeed, if a man should marry young, it may never come at all.

In spite, however, of the prevalence of the inferiority complex among young men in the educated classes, it is nevertheless true that the characteristics of young men are usually such as to demand a restraining rather than an emboldening influence. For, as Bacon says: "Young men are fitter to invent than to judge, fitter for execution than for counsel," and further, "Young men in the conduct and manage of actions embrace more than they can hold; stir more than they can quiet; fly to the end without considering the means and degrees; pursue some few principles which they have chanced upon, absurdly; are not cautious

to innovate, which draws unknown inconveniences; use extreme remedies at first; and (that which doubleth all errors) will not acknowledge or retract them, like an unready horse that will neither stop nor turn." Thinking people are paying more attention to rational psychology than they were wont to do before the war. Young men are no longer expected to be all of one pattern, individuality is recognised, and there is now no difficulty in obtaining helpful advice for those who find certain difficulties and complexes in their attitude towards life; and they should be encouraged to seek such advice.

On the physical side, most of the difficulties incidental to this period of life arise from unsuitable feeding. These show themselves most conspicuously in the skin. From the time of puberty when the sexual glands first pour their hitherto unaccustomed secretion into the blood stream and thus revolutionise the whole organism, the state of the skin becomes, so to speak, an index of the



PHYSICAL DRILL IN THE ARMY

Parallel bar exercises involve considerable muscular control.

[Reynolds]

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satisfactory adjustment of the economy to the altered conditions. There is a special relationship between the sexual glands and the integument, or natural covering, with its appendages. Puberty is announced by the growth of hair in certain areas and the small glands in the cutaneous covering (skin), the sweat glands, and the sebaceous glands (small glands situated beside hairs), increase their activities for a perceptible period after puberty is passed. Certain cutaneous disorders are liable to appear at puberty, and unless their cause is removed, the disorders continue into early manhood, and even later. The cause is usually to be found in the diet. At puberty the skin becomes an excretory organ, and if upon this newly-constituted evacuator work is thrown for which it is not physiologically adapted, it is liable to signify its resentment by unsightly eruptions. The pimples which disfigure the faces of adolescents and young men are due entirely to ignorance or neglect of the two fundamental rules of healthy living, namely, wholesome intake and adequate output.

The same causes determine the dyspepsias which are so common at this time of life.

The general unsuitability of the intake is no doubt in very many cases emphasised by an excessive consumption of attractively presented foods washed down by a superabundance of alcoholic drinks. To this must be added the fact that when maturity is definitely established, a man puts away the athletic habits of his immediately post-puberal days, in order to envisage money-making and matrimony, but he seldom so reduces his intake as to synchronise with his now sadly restricted output. The inevitable dyspepsias are associated with constipation, headaches, irritability by day and insomnia by night. When seeking relief from these troubles the victim may admit to his doctor that he has reluctantly reduced the amount of exercise which used to keep him fit, but it has never occurred to him to redress the balance at the other end by reducing his intake. Nature redresses the balance for him by the unpleasant but efficacious ex-

pedient of a bilious attack, and he is able to restart the vicious circle on what is to all intents and purposes a clean slate. To quote Bacon again, "strength of nature in youth passeth over many excesses which are owing a man till his age"—which means that the physiological laws of healthy existence may be broken with a certain measure of impunity when one is young and vigorous, but the impunity is more apparent than real, for there is a Nemesis, tardy but inexorable, awaiting him in middle age.

The excesses of which one naturally thinks in this connection are associated with alcohol and tobacco. With regard to the first, let it be understood quite clearly that no healthy person requires alcoholic drinks, and that save when taken very occasionally, to prevent staleness, they militate against the highest athletic output.

In ordinary times the consumption of alcoholic drinks in strict moderation may be regarded as a legitimate indulgence. The wise young man will make it a rule never to have a drink before dinner-time, and to eschew cocktails as he would the plague. The whisky-and-soda at bedtime—the old fashioned "night-cap"—should be reserved for very old men. One of the most serious counts in the indictment which could be brought against the consumption of alcoholic drinks is one which is very seldom mentioned. It is that the wine, or whatever the drink may be, increases the appetite. A very much larger quantity of wholly unnecessary food, usually of the wrong sort, is thus consumed, with indigestion and constipation as inevitable consequences. On the other hand, it is to be remembered that teetotallers are usually large consumers of sugar; for in some curious way sugar seems to supply a something to the economy which renders the absence of alcohol more bearable. The ordinary white sugar of commerce is a very indigestible chemical compound (made by pouring nitric acid on to starch), whose consumption, even in moderation, not only irritates the lining membrane of the stomach and intestines, but promotes the deposit of fat in the tissues, especially in

THE SEVEN AGES OF MAN

the tissues about the abdomen. If, therefore, a young man decides to eschew the Scylla of alcoholic drinks, he must be careful of the saccharine Charybdis.

It happens to very few young men to enter upon their maturity as complete teetotalers; most of them have tasted alcohol in some form, usually a mild form, like beer, in circumstances which have favoured its rapid excretion. The young adult is therefore to some extent familiar with drink; he

has tasted its pleasures and can scarcely have escaped some recitals of its potential dangers. With tobacco all this is different. It is necessary to serve an apprenticeship to smoking. Nobody really enjoys his first few excursions into the realms of my Lady Nicotine. These earlier adventures are apt to be punctuated by nausea and vomiting, but such is the desire of the late adolescent to wear the trappings of complete adult emancipation that he will persevere with his

apprenticeship, however unpleasant he may in reality find it. Such being the usual attitude of the young man towards tobacco, it would obviously be waste of time to warn him that nicotine is after all a poison which he can very well do without, and that he would be richer both in health and in pocket for abstaining.

It is easier, and on the whole more productive of good results, to insist upon two points in connection with smoking, the ob-

servation of which certainly does mitigate the harm which it is calculated to do, the degree of harm being very much greater in some people than in

others. The two points are (a) no smokes before lunch, and (b) never inhale. In the matter of (a), whose context is equally important, "no drinks before dinner," it seems to be the general opinion that nicotine is more easily absorbed in the morning than

it is in the afternoon, so that in spite of the admitted laxative effect of the after-breakfast pipe, the first smoke of the day should be deferred until after luncheon. On the iniquity of inhaling every one is agreed. It is unfortunate that the latter-day vogue of the cigarette, as against the pipe or cigar, should seem to encourage the tendency of smokers to draw the nicotine-laden fumes deeply into their ultimate air passages. Such a practice must of necessity weaken the powers of resistance in the air

passages as a whole and increase the liability to catarrhs, colds, bronchitis, and such-like maladies, which by the bye are among the excesses which are owing to a man till his age, for it is usually not till he is over fifty that he has reason to cough his curses against the stupidities of his youth.

It is sometimes said that inasmuch as the fumes of tobacco contain formalin, smoking exercises an antiseptic effect upon the mouth. This is pure nonsense. The effect of tobacco



MUSCULAR PERFECTION

A statue in the Vatican Museum, Rome, showing the ancient Roman ideal of muscular development.

[Anders.]

THE GOLDEN HEALTH LIBRARY

smoke upon the mouth is the same as its effect upon the rest of the tissues, namely, primarily that of a mild sedative. Sedatives applied regularly to any tissue for any length of time lessen the powers of resistance in that tissue, so that it is more liable to be invaded by certain bacteria than tissues which have not been so treated. Hence it follows that the mouths of smokers are more liable to carious teeth, pyorrhoea, and tonsillitis than the mouths of non-smokers.

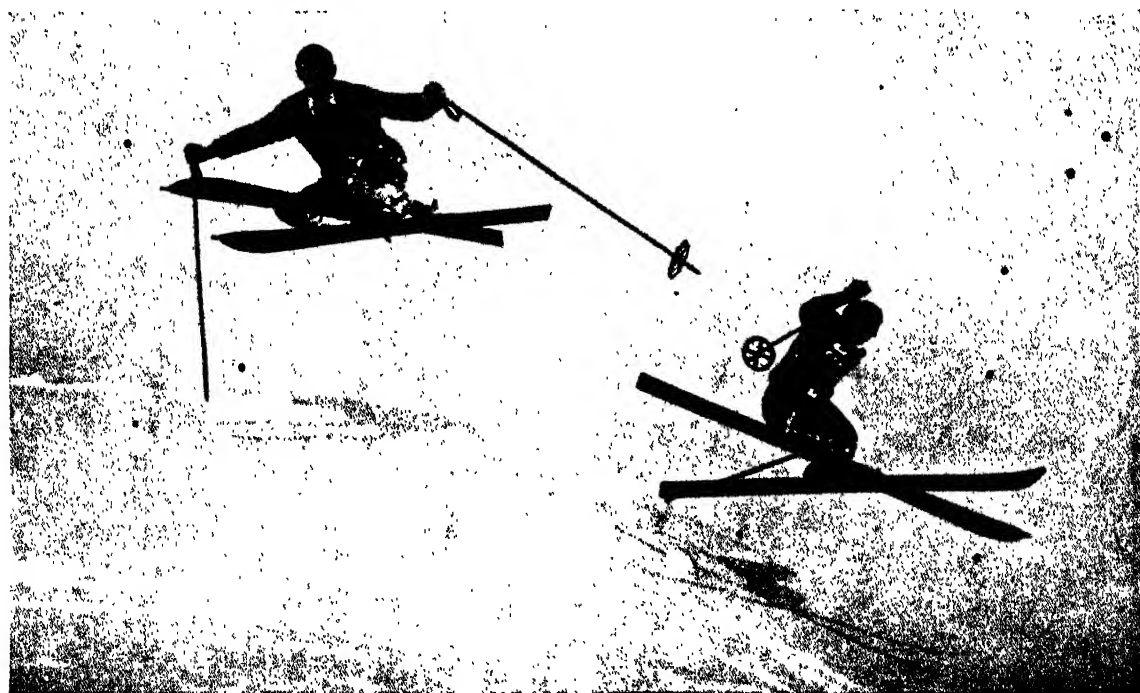
Apart altogether from smoking, tonsils are liable to be a source of considerable trouble

• in early adult life. It is curious to note how few people there are who realise that tonsils are intended to be purely temporary

organs, and that their persistence after the age of, say, 18 years is not only unnatural, but is fraught with considerable danger. An organ which no longer subserves a useful purpose becomes a foreign body, an unresisting nest in which bacteria of all sorts settle themselves and multiply. This is what happens in the case of persistent tonsils

situated at the portal of both respiratory and gastric systems ; they constitute a potential danger to the whole economy, and if there is reason to believe that they are responsible for any unpleasant symptoms they should be removed. In adult life they are no longer capable of doing any good, and are conspicuously capable of considerable harm.

There is another department in which Bacon's saying that "strength of nature in youth passeth over many excesses which are owing a man until his age" is very particularly appropriate, namely, the ocular department. It is quite easy for young people to overcome slight visual defects, and it consequently does not occur to them to attribute such troubles as headaches, neuralgias, and bilious attacks to their eyes. Very few people have perfectly normal eyes, just as very few have perfectly symmetrical faces, but the visual defects trouble their owner, whereas the facial defects only strike the observant among the passers-by. It is exceedingly difficult for a man who has been noted for a good eye at cricket or golf to



A TEST OF SKILL

An exhilarating sport which requires physical fitness and muscular control. •

[Central Press

THE SEVEN AGES OF MAN



THE GRACE OF EARLY WOMANHOOD

realise that a few columns of figures will constitute a bunker which it is only possible to negotiate with the aid of a pair of glasses. It is a good rule which bids every one, well or ill, to pass through the dentist's chair once in six months ; it is an equally good one which directs a young man who is starting the serious business of life to seek the advice of an oculist. Here, almost more than anywhere, is prevention better than cure.

WOMANHOOD

By **BARBARA G. R. CRAWFORD, M.B.E., M.B., Ch.B.**, late Senior Resident Medical Officer at the Borough Isolation Hospital and Sanatorium, Leicester.

THE special problems of health in womanhood are those directly or indirectly connected with her functions of motherhood, whether actual or potential. By motherhood I do not mean merely the episodes of pregnancy and childbirth, but the whole development and functioning of her body and mind as they are shaped and specialised for that purpose. Apart from this function and the vital differences involved in it, a woman has no more—in fact, less, in many instances—ill health to fear than a man has. There is no task he can do which she may not also successfully attempt ; her vitality

is as great or greater, and her expectation of life is actually longer.

For the normal woman the function of motherhood cannot be put aside : it is the core of her being, and is so vitally important and makes such a fundamental difference to her body that it may be said to obsess her whole life. Nature has laid almost the entire burden of human reproduction upon woman and has formed her for this purpose.

This difference, so great and so important, is patently no “inferiority,” but something calling for respect and honour, for care and safeguarding. If it absorbs her energy so as to handicap her in some other walks of life, this is no reason for adding artificial handicaps to those already imposed by Nature.

The actual periods of pregnancy and childbirth, with their dangers and disabilities, are dealt with elsewhere.

Sex Equality. Those differences which her femininity makes to the life and outlook of the ordinary woman—to show that she is not a “lesser man, but diverse”—will now be discussed. Always we must remember that men and women are differently constituted ; those who speak of their “equality” are either wholly ignorant of the subject or of the meaning of words. In what way are they equal? None : not

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in strength, nor in height nor weight, nor food-requirement, nor resistance to disease, nor in energy, nor in the various qualities of mind. In some of these men excel, in others women, in none are they equal.

Those who advocate the full legal equality of women with men and who would hold them equally responsible financially for the support and education of their children, ignore the fact that when a child enters the world the mother has already contributed such a share that if the father supports the child thereafter it will not make their contribution equal.

It must be realised that men and women are differently organised, and require different arrangement of their lives if the best and happiest results are to be obtained. Recent experiments have shown that the energy output of a healthy young woman

approximates to about 60 per cent. of that of a healthy young man. This seems surprising when one notices the agility and athletic limbs of the modern girl. But though woman expends so much less energy, she has great reserve vitality. It is as if Nature had placed man's inheritance of energy all in a current account, but woman's largely on deposit, not to be withdrawn except for

the benefit of the next generation. In body and mind, woman tends to maintain the average of the race more than man does. If she is less often a genius, she is naturally also less often a criminal or a freak; she preserves the mean.

As the reproductive functions so greatly dominate the physical life of woman, so

does the maternal instinct dominate her mental life. This instinct fosters the development of altruism, humanitarianism, and social service. It is the instinct for the care of the helpless, for consideration of others, and for self-sacrifice. It is primarily the possession of the mother, and, through her, it passes to her sons as well as to her daughters. Thus self-seeking is controlled and civilisation made possible.

Until the age of 40 (or later), much of a woman's life and thoughts are occupied or pre-



NET BALL ON THE BEACH
Women vie with men in healthy exercise.

[Sport & General

occupied with motherhood—it may be unconsciously. But it is her potential motherhood which makes a woman less ambitious and pushing in her career than a man; a schoolgirl less “all-out” in sports or studies than a boy. She is definitely, though often unconsciously, withholding part of her strength for that future purpose

Potential
Mother-
hood.

THE SEVEN AGES OF MAN



MODERN GRACE AND VIGOUR

[Topical

Miss M. Clark of South Africa winning the hurdle race in the women's athletic championship at Stamford Bridge—a picture typical of woman's new freedom.

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which she feels is her goal. To the average woman, other pursuits are temporary and of secondary importance compared with her great task of continuing the race. For this reason, because of this preoccupation, she is seldom first in other work, seldom excels gloriously as men do. She *can* do so if she definitely renounces motherhood, as many exceptional women have shown, who have vied with and outstripped men in their own most jealously-guarded spheres—the women-warriors, preachers, and leaders who startle the world from time to time. But the vast majority of women always have and always will store their reserve for the use of the coming generation, and so will not equal man in any given task unless it is of such a nature as to bring her protective instinct of motherhood into play.

But the natural sex differences, great as they are, have been unduly and unnecessarily increased by custom, and by woman herself. Her clothing (until recently), her home, her cooking, cumbersome etiquette, have all hampered and handicapped her and absorbed her time and strength so that she has had little left for competition in other fields of work. This is a foolish waste, for woman has much work to do in the world, and the very fact that it is not the same as man's work makes it the more valuable and essential.

Women's lives must be simplified if they are to have time to live fully and usefully.

For good or ill humanity has left many of Nature's ways behind, and must continue to eat cooked food, to live in houses, and to clothe the body warmly; but there is much harmful and needless complexity which can well be dispensed with. One simplification is to be less busy. Women require far more rest than they usually take, times of rest and quiet during the day as well as sound sleep at night. Many a nervy and overstrung woman is suffering from restlessness, lack of rest. She does not allow herself the necessary recuperative periods to quieten her nerves and "collect herself," with the result that the quality of her work suffers,

and she ages before her time. All animals know the value of rest—after hunting, the dog or the cat sleeps for hours; the horse and the sheep spend many hours resting between times of activity; and the longer-lived animals all have great periods of quiescence. In primitive human life many hours of the day are spent in rest or sleep; only in civilised life do we find creatures actively "on the go" for sixteen hours out of the twenty-four.

Again, for some women it seems to be fatally easy to go from the one extreme of too much to the other of too little. To be too lightly clad in cold weather wastes energy through loss of heat, and so vitality is impaired. In our cool and uncertain climate adequate protection is needed if we are to be well, to work well, and to look well. It is probable that most of us could in time become so inured to cold that we could dispense with clothing almost completely. Our skins would become "all face," as the Redskin chief is reported to have said of his own. But we would require to eat much more food, and to lead lives of great muscular energy, and in the meantime the plan certainly would not work well for town life or sedentary occupations. For woman especially, moderation in all things is best. Light warm clothing, sufficient rest, pure fresh air and water, and good foods: these will fit her for the active hours of work which are essential to her well-being.

One great fault with women which can easily be avoided is that almost as soon as their schooldays are past many give up all forms of muscular exercise, and allow themselves to grow soft and flabby. Women have smaller muscles and lighter bones than men, but these muscles need not be less firm and healthy. Women would be far more fit, and would avoid many ailments and distresses, if they kept their bodies as well tuned and strong as Nature intended them to be.

A healthy woman who has reached adult life should not be troubled by pain or excessive loss at her menstrual periods, and except for the usual precautions required

THE SEVEN AGES OF MAN



HEALTHY WOMANHOOD
A typical Margaret Morris study.

[Daily Chronicle]

for cleanliness and comfort, and the avoidance of strenuous sports and of swimming, her work and her play need not be interfered with at these times.

Function- Among the hardy peasant women
ing of the Womb. of the south who share in the
toil of the fields, the menstrual
flow is slight, and causes little inconvenience
and no pain or distress. It is the softer-
living women of the towns and cities who
suffer in these ways, and with whom the
function becomes disturbed and distressing.
The harder we keep ourselves in mind and
in body, the more natural and easy are all
our functions.

The slackness for which many women
have themselves to blame is the cause of
many of the displacements and prolapses
of the womb so common even before
middle age. There are other causes, no
doubt, but in many instances the cause is
muscular laxness of the pelvic floor and a
slack condition of all the tissues of the
lower part of the body. This is brought
about by neglect of suitable muscular
exercise and by constipation, which latter
(by overloading the bowel) actually presses

down important organs, and (by allowing
poisons to accumulate) so weakens the
tissues that falling or prolapse of the womb
may occur, or (by impeding the circulation)
may bring on piles and other torturing
afflictions. Regular actions of the bowels,
and careful avoidance of constipation, are
the primary and essential means of ensuring
health. Those who neglect to form these
good habits cannot be well, and they are
laying up the seeds of a harvest of misery
later on.

In a little book called *Exercises for Women*,*
Mrs. Ettie A. Hornibrook has described
several simple exercises for the
Attaining pelvic and abdominal muscles
Fitness. which can be carried out at odd
moments—at any time of the day. These
exercises require no apparatus, involve no
great exertion, and take up very little time ;
but, carried out regularly, they so strengthen
the muscles of these important parts that
prolapses and displacements can be largely
avoided—even cured, unless too far advanced
—and regular evacuation of the bowels is
greatly aided.

* See illustrations on p. 85.



CURLING AT ST. MORITZ

[Oil mar kuts]

Curling, like its first cousin, bowls, is a favourite pastime of middle age, since it provides exercise in the open air without excessive fatigue

MIDDLE AGE

THE MIDDLE-AGED MAN

By **LEONARD L. B. WILLIAMS, M.D.**,
*Physician to the Legal and General Assurance
Society; late Physician to the Miller Hospital,
Greenwich*

It behoves the man of middle age (that is from 40 to 55, and perchance a few years longer) to take heed of Bacon's advice and "discern of the coming on of years, and think not to do the same things still." If he can legitimately do the same things still, then so much the better—but if he persists in doing them despite the writing on the wall, then trouble is not long in coming. There are certain maladies which lie in wait for the man of middle age, and they are all, through wilfulness or ignorance, the result of neglecting some of the fundamental laws of healthy existence. The law which is most commonly transgressed is that which imposes strict moderation in eating and drinking. There is a large number of people—educated, sensible people—who seriously consider it to be quite normal and wholesome for a man

to increase his weight by a stone or more between the ages of 21 and 40.

The truth is that obesity in any degree, however slight, is, in man, a physiologically unpardonable offence. One has only to consider what a difference to a horse an extra pound on his back makes to its prospect of winning a race, to realise what a handicap even half a stone must be to the maintenance of full physiological fitness. Man, as opposed to woman, is intended by Nature to keep himself "in the pink." Such men as failed to do so in primitive times were unable instantly to spring to defence or attack, and were consequently wiped out. The same man to-day is made Chairman of Directors, and dies of a tight collar and an apoplexy at 50 years of age. In the matter of what is a suitable weight for any given individual, it must be admitted that there is no reliable guide. The published tables are conspicuously unreliable. The region which should be examined for the first signs of obesity is the area immediately surrounding the umbilicus

THE SEVEN AGES OF MAN

(navel). When there is any definite sign of more than a very moderate deposit of fat in this area, it is well to take measures against any further increase. The only measure to which the ordinary man turns in such circumstances is increase of exercise, which he proceeds to protest is impossible for him. Such a plea is usually absurd. Any man, however busy, can always make the time, say a quarter of an hour daily, for the performance of well-selected exercises for which no special apparatus is necessary, and these he can glean from many a book. In the first instance, however, a human instructor is better, if only for the encouragement which he will give for the perseverance with measures which, it may be admitted, are apt in the long run to become rather boring. But an increase in the amount of exercise is by no means the only method of checking the middle-aged tendency to obesity: there is a much more important one, which has the merit of being simpler. I mean fasting.

Apart altogether from the question of counteracting a tendency to obesity, fasting is a most excellent measure of general health, mental and physical efficiency, and longevity.

When once a person has made up his mind to fast, provided he observes certain precautions, he will find it a very easy thing to do. The precautions are two. The first is that he must not begin his fast until he has thoroughly emptied his intestines with a dose of castor oil or its equivalent. The reason for this is that if this precaution be neglected, the patient is very liable to re-absorb undesirable material which is almost certain to be lurking in his large intestine. The other precaution is to keep warm. One feels the absence of the fuel value of

food, especially when one is unaccustomed to fasting, so that it is well to make the first experience over the week-end, when one can keep one's bed with impunity. For the rest, the fast must be absolute; nothing but water must pass the lips. The length of a fast is a matter for the individual to decide, and should be determined by the conditions which have rendered the fast desirable. Three full days' complete abstinence is sufficient for almost all purposes; two days is very useful; one day will reduce weight, especially if practised regularly, say, once a week.

When one has served an apprenticeship to fasting, it becomes child's play to miss an occasional meal. It is not of course necessary to point out that the tendency to obesity is frequently promoted by quite a moderate quantity of the wrong foods, and that if people who are great consumers of fats, starches, and sugars are taught to moderate their intake of articles in which these principles are strongly represented, their tendency to obesity will recede.

Of the "writings on the wall," other than obesity, which are liable to show themselves in a man of middle age, two remain to



(Topical

TESTING BLOOD-PRESSURE

High blood-pressure is one of the maladies of middle age which make periodical examinations so necessary, since it is seldom suspected by the patient.



[Hana]

PUMPING EXERCISE: FIRST POSITION

In this exercise, one of a series intended for daily use to improve muscle tone and prevent constipation, begin with the abdominal muscles completely relaxed, then breathe in slowly, allowing the air to distend the abdomen.

be noticed in this article. One is breathlessness on slight exertion, the other is a skin which is liable to strange eruptions. The first, breathlessness, is of course characteristic of obesity, but it is quite as characteristic of conditions in which obesity plays no necessary part. The chief of these is high blood-pressure. This is a condition which is impossible of diagnosis to any one save a medical man armed with rather an elaborate instrument. So far from suspecting himself to be the subject of high blood-pressure, the victim is usually conscious of a sense of stimulation and well-being, which he is naturally slow to attribute to any sinister cause, until something startling overtakes him. This, more often than not, takes the

High
Blood-
Pressure.

pressure. This is true even of haemorrhoids (piles), which are frequently regarded as almost normal at the period of life which we are considering. They are, of course, nothing of the sort; they are grossly abnormal, and even more important than their cure is the removal of the conditions which encouraged their development; conditions which usually include abdominal opulence and the chronic constipation of the overfed.

Under no circumstances can it be regarded as entirely satisfactory to have a sustained blood-pressure of over 140. It must, however, be remembered that the blood-pressure rises—often acutely—under very slight provocation; the mere fact of having it measured, sufficing in some nervous people

to send it soaring up to very disquieting figures. A manometer (as the instrument is called) should never be in the hands of any one but a medical man. Whenever it is, it manufactures a neurotic. High blood-pressure and the diseases and fatalities (notably kidney disease, heart disease, and apoplexy), which are consequent thereon, are due to certain toxins. The exact nature of these toxins is



[Courtesy]

[“Culture of the Abdomen”]

PUMPING EXERCISE: SECOND POSITION

Contract the abdomen slowly and steadily, expelling the air as far as possible, and finish with the abdominal wall well drawn in. These exercises are beneficial even to delicate people.

THE SEVEN AGES OF MAN

unknown, but it is certain that they are the products of so-called civilised life—faulty diet, over-indulgence in luxury, and deficient excretion.

The only remaining writing on the wall with

which it is possible to deal in a short article

refers to cutaneous eruptions. The times have happily gone by in which a murrain was properly treated by the local application of an unguent. Dermatologists pry more deeply into the meaning of eruptions, for they realise that these unsightly and irritating maladies come from within, and can be successfully treated only by attacking them at their source—which is the blood. Impurities circulating in the blood are almost certain to give rise to an eruption on to some portion of the integument, and unless these impurities be removed by suitable intake and adequate output, though the "gouty eczema" may be relieved, it will never be cured. The blood impurities most liable to occur in such circumstances are usually to be discovered only by careful examination of the urine, and as the man of middle age seldom causes his urine to be examined so long as he feels moderately

well, the danger signals are never seen until they have been in existence for some time. The two danger signals are the presence in the urine of albumen and sugar. Albumen, if it be constantly present in the urine of a man of over 40, must be regarded as definitely pathological and indicative of disease in the kidney, and if this disease be associated with high blood-pressure, the condition is a serious one.



HAMMOCK SWING EXERCISE

Raise the hips about 3 inches from the floor while the weight rests on head, shoulders, and feet; swing the body vigorously from side to side, throwing each hip upward alternately, ten times each side.

Occasional albuminuria may be due to lapses from dietetic grace, such as is afforded by a civic banquet, and may safely be disregarded, but if the albumen should persist in spite of a return to good dietetic behaviour, then it is time that a physician were brought into the picture. The same is true of sugar in the urine. Sugar may very easily appear in the urine of any man at or soon after middle age, and its occasional appearance is without sinister significance. Nevertheless, if it has once been discovered, the urine should be periodically examined, and if the reaction persists in spite of a rational diet, then the matter should be referred to a competent physician who, with the aid of insulin or otherwise, will



Courtesy]

["Culture of the Abdomen"]

TENSING AND RETRACTING EXERCISE

Bring head and feet as near together as possible without jerking, bending the knees, or hollowing the back, until all the muscles are contracted. Lower shoulders and feet to the floor and retract the abdominal wall, contracting the seat.

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know how to correct the morbid tendency.

Respiratory troubles belong in reality to a rather later stage of life than middle age, but the foundations of such trouble are usually laid between 45 and 50 by an increasing liability to **Respiration, Rheumatism, Neuritis.** coddle; to increase the under-wear, augment the food, close the windows, raise the temperature of the bath, and do other things which a wisely solicitude enjoins in the mistaken hope of preserving a waning virility.

The rheumatisms and neuralgias which often declare themselves at this period of life are almost invariably due to the absorption of poisons from some septic focus. This focus very often exists in the mouth, not only in the sockets of the teeth, but in the tonsils. The nasal sinuses are not infrequently the offenders. In every case of rheumatism of whatever kind, a search should be made by specialists for the source of the mischief. Some kinds of neuritis are caused by tobacco-smoking. It is well for a middle-aged man to remember that nicotine is a poison, for when one has been doing a thing with impunity for twenty-five years, it is difficult to believe that it can ever give rise to unpleasant symptoms.

MIDDLE AGE IN WOMAN

By **BARBARA G. R. CRAWFORD, M.B.E., M.B., Ch.B.,** late Senior Resident Medical Officer at the Borough Isolation Hospital and Sanatorium, Leicester.

For the woman who has passed her "fortieth" year certain problems arise. Middle age means so much more to her than it does to a man; it brings changes to her quite unknown to him. For a man the decade between 40 and 50 years of age brings a certain gradual slowing of physical functions which necessitates adjustments. Conscious or otherwise, there is a lessened desire for strenuous sports or great exertion, and a correspondingly lessened food-requirement. At this time the mental powers are at their height, and the lessened calls of the body make for increased clearness of mind.

The emotions are calmer and more controlled; knowledge has been gained in life's journey, and the man can live less extravagantly as regards energy output. At this time there should be no sign of age's later decay, but a calm and well-balanced working of body and mind.

For woman, middle age means all this and more; it means to her the definite closing of one great sphere of life's activities, for at this time she leaves behind her the child-bearing age.

This is a stupendous change. Until now, from early adolescence, her physical life has run in a series of cycles of activity and quiescence of the great reproductive functions. Now she is leaving all that behind her, and her body, which has been tuned to the potential service of the future generation, is for a time thrown out of its smooth-running gear and may have difficulties to contend with before the new adjustments are complete. When such a fundamental change takes place, it is not to be wondered at that disturbances occur in some. Indeed, it is wonderful that in most cases the change is so easily accomplished.

At this time a woman is sometimes tempted to give way to ill health not altogether imaginary. She may experience a strange depression and feeling of uncertainty. Those wonderful regulators of metabolism, the endocrine glands, are altered in their functions, and she hardly knows if she is well or ill. The well-known "flushings" may disturb her; nervousness and feelings of irritability and weakness may appear; she may feel unfit for her work in the home or outside it.

Middle age is the time when our sins against the laws of health find us out. If the woman has been self-indulgent and foolish, she will have the bill presented to her by Nature. In youth, the ample reserve, which most of us then possess, allows us to transgress with apparent impunity an astonishing number of Nature's laws, but the judgment is only deferred. It is in middle age—from the forties onwards—

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that if we have over-eaten, we become fat and unsightly, short of breath, and suffer from palpitations; if we have been intemperate with stimulants, our arteries harden, and apoplexies threaten us; if we have broken Nature's laws in these or other ways, our skins coarsen, we become "liverish," and are liable to develop chronic rheumatism or bronchitis. It is middle age which is beset with disorders such as gout, diabetes, prolapses, growths, and all the other hideous penalties of ignorance or self-indulgence.

But for the wise and healthy, it is very different. Released from the stress and inexperience of youth, middle age should be perhaps the best part of life, a time of calm achievement, of wisdom and fruition.



[Hana]

AN EXERCISE FOR GRACE AND HEALTH—I

In this "semi-rotation exercise" stand erect behind a chair, holding it firmly with one hand. Bring knee up to the height of abdomen, then extend leg straight out in front of body, stiffening knee and turning up toes.

So for the normal woman there is nothing to fear, the troublesome aspects of the change will pass, and she may look forward with confidence to twenty or more years of useful and happy life before ever she need dread the approaching disabilities of age. In middle age, as at all other times, courage is the first virtue, and serenity the greatest charm. If a woman guides her life on common-sense health principles, avoiding excess of every kind, she will pass safely through the trials of this transition, and the energy previously reserved for her children, possible or actual, will be liberated for wider uses.

A middle-aged woman should not hang on to the past; she should face her new phase of life and activity joyfully. She



[Courtesy]

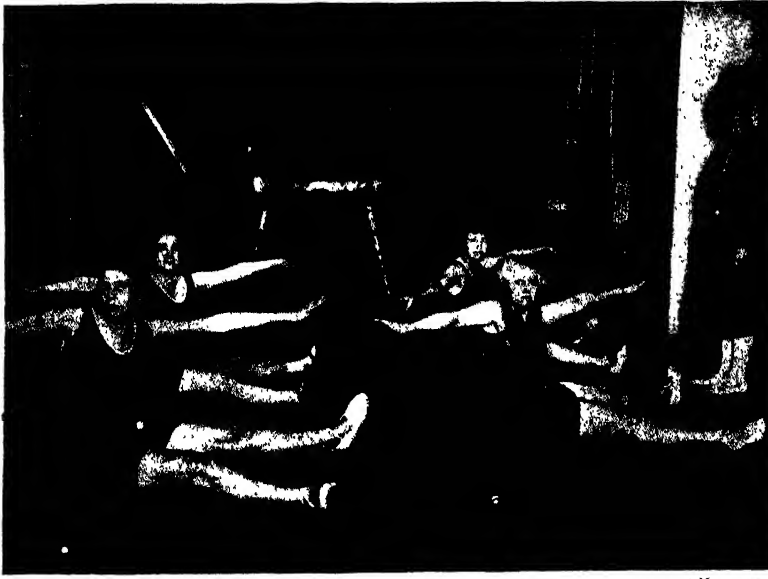
["Lac es for Women"]

AN EXERCISE FOR GRACE AND HEALTH—II

Circle leg outwards and round to the back of the body, keeping it still stiff and straight. Press hands hard down on chair-back and bring head and shoulders well back, contracting muscles of lower back and buttocks while the leg is extended fully behind. Relax and repeat five to eight times. This series will supplement or replace

• daily outdoor exercise.

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[Keystone

EXERCISE FOR THE MIDDLE AGED

To give up all forms of muscular exercise, as so many women do, is to become soft and flabby—an unnecessary condition at any age. These women are keeping fit by attending regular gymnastic classes.

should turn her thoughts outwards, not inwards, upon herself, and should devote herself to some work or interest which will absorb the energy now no longer needed elsewhere. Looked at aright, it is a time of emancipation: for her, life in closing one door is opening many others, and she can go forward with a calm assurance unknown to her youth.

We cannot use our powers to the full unless our bodily functions are in perfect order. Health must not become a fad or obsession, though all necessary means must be taken to be well and to keep well. As already explained, there are dangers peculiar to this time as to every other—infancy, childhood, adolescence, wifehood, motherhood. All alike have special dangers to meet and overcome; so with middle age when certain organs are ceasing to function. The special danger of middle age is that these organs—the breasts, the ovaries, and the womb—may take on a perverted activity and develop abnormal growths as their normal functions are ceasing. Or, if the blood is impure and the tissues low in vitality, such disorders may appear in almost any region of the body.

How can this be prevented? For the woman of middle age with whom all does not go smoothly and well, medical advice should at once be sought. The smallest lump or hardness of the breast should call for immediate attention; and abnormal hæmorrhage, discharge of any sort, and, of course, pain, should never be disregarded. Any of these may mean little or nothing, but, on the other hand, they may indicate the beginning of serious disease, and only a doctor can tell which it is.

But these troubles are

the exceptions after all. To most no such things happen.

What are the rules of health that one should follow? First and foremost, there must be an interest in life, some definite aim, some goal to which to direct one's efforts, without which care of one's own health

and person becomes a pernicious and self-frustrating pursuit. One should determine to be well and keep well in order that one may serve one's family, one's profession, one's country, and the human race; in order to help all and be a hindrance to none. With such an aim the battle is half won.

The chief practical points to follow are these. A woman in middle age requires less food than she did when twenty; she also needs simpler food, fewer sweets and chocolates, and she must resist the tendency to whip a tired digestion with stimulants, pickles, and strong tea. If she indulges in these, the penalty will be dyspepsia and a dyspeptic complexion. Her meals should be light, regular, and plain; and should include fruit, salads, milk, wholemeal bread, meat in moderation once a day, eggs if they agree, fish, and vegetables. If she is

Practical
Health
Hints.

THE SEVEN AGES OF MAN

inclined to stoutness, potatoes and milk puddings should be avoided. Freshly-made tea is allowable, not too strong, and plenty of water must be taken, especially first thing on rising in the morning.

The bowels must be perfectly regular, no suggestion of constipation should be permitted even for one day. The foods mentioned above, with plenty of water, will go far to regulate evacuation, but should anything further be required, suitable exercises may put things right. Sluggishness of the bowels requiring more than this, amounts to a definite malady, and must have individual medical advice. More especially for the woman of sedentary occupation, regularly planned exercise is essential.

Walking is good ; swimming, cycling, and riding are excellent for those with skill and opportunity. In addition to, or instead of these, special exercises, such as those illustrated on page 85, keep the hips slim, and stimulate the abdominal organs to healthy activity.

Sleep should be sound and regular ; eight hours is not too much for a woman who leads an active life ; the bedroom must be well ventilated, as should be every room in the house.

Middle age is a time of adjustment to new conditions ; the completion of certain of life's tasks, the continuance of others ; and a woman will find that the more full and busy is the life she leads, the less will its changes trouble her.

THE ELDERLY AGE

THE ELDERLY MAN

*By Sir W. ARBUTHNOT LANE, Bart.,
C.B., M.S., F.R.C.S.*

WHEN men have reached what is commonly spoken of as the elderly age, a time which is very elastic and does not correspond to any particular year in the life of the individual, since the vigour and ability to do physical or mental work efficiently varies enormously in different people, it is well to consider how far they are justified in pursuing the same occupations and in continuing in the same degree the sports and exercise they have been accustomed to previously.

A man who has lived wisely, by which is meant one whose diet has comprised such foods as are essential to health, who

has avoided constipation and indigestion by attending regularly to the sufficiently frequent action of his bowels, who has not indulged to excess in alcohol, who has not made too great a demand upon his tissues, especially his brain, heart, and blood-vessels, by violent and prolonged physical or mental



Courtesy]

[Lieut. I. P. Muller

ON THE SKATING RINK

In the right environment such healthful exercise, combined with sun-bathing, can safely be recommended to most elderly men.

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exertion, and has consulted his medical attendant and dentist at regular intervals, and has indulged in periods of rest and change, may feel justified in expecting to live for the full period of life free from disease, and in the less strenuous enjoyment of his mental and physical powers, and to die of old age.

While he is no longer able to take prolonged or violent exercise, there is no reason why his intelligence and general mental qualities should not function perfectly as

associated chronic intestinal auto-intoxication, whose kidneys are not functioning as perfectly as they should, or who feel that their capacity to do good work and form important decisions are not what they used to be. Such men should consult their medical attendant, be thoroughly overhauled, and obtain from him all the advice requisite to mend the wear and tear in the body as a whole, and especially in the organs or tissues that are manifesting particularly distinct degenerative processes.

Immense benefit can be derived by such people from dieting and careful medical supervision, especially from avoidance of such animal foods as increase that degree of intestinal poisoning which is the cause of so much tissue degeneration and disease.

That man who devotes to his body as much daily

The care as does Mechanics the chauffeur of Health. in providing

the motor-car with good petrol and suitable oil, and in keeping the bearings perfectly clean, will be well repaid in securing the greatest duration of life of his several tissues in spite of already

pre-existing changes in them. While taking every necessary precaution not to make too great a demand upon a machine whose component parts have suffered from excessive or improper use, it is well to remember that to keep them in health every portion of the mechanism requires to be retained in a state of activity, and this should be effected by some form of exercise most suitable to the physique and to the inclinations of the individual. Very much benefit will accrue from the performance of



[Courtesy]

ON SKIS AT SIXTY-THREE

[Lieut. J. P. Muller]

J. P. Muller, the well-known physical culturist, whose fine muscular development was still unimpaired at the age of sixty-three.

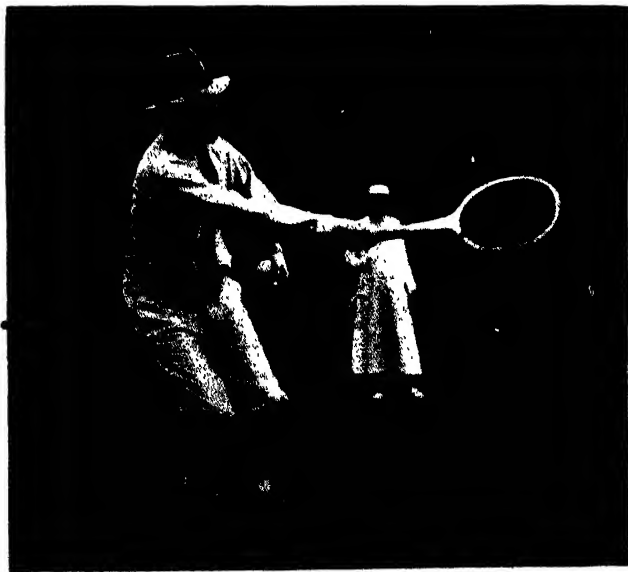
long as he lives. At this period of his existence, experience, accumulated during a long lifetime, and steadily maturing, should make him invaluable to the State, and especially to those dependent on him.

There is a large number of men who, through lack of such care and precautions, have become abnormally stout or thin, or whose heart and blood-vessels have undergone degenerative changes, either because of excessive exercise or because of chronic constipation with its necessarily

THE SEVEN AGES OF MAN

certain physical exercises at regular intervals during the day, bearing in mind that those are most advantageous which bring into action the abdominal muscles, which by their vigorous and frequent exercise stimulate the intestines to propel their contents along their length and so avoid stagnation in any portion of the gastro-intestinal tract. Many exercises can be performed with a minimum expenditure of nerve and muscle energy while in the bath. Time spent in this manner well repays in that not only the muscles of the abdominal wall, together with those of the intestines, but every muscle and joint in the body can be thoroughly exercised in a very brief period of time to the great advantage of the general state of health.

The idea that advanced age in man must necessarily involve an arm-chair existence and a state of intermittent somnolence is obsolete. Men are now never too old to lead a more or less active life. Much, if not all, of this physical degeneration was due to incorrect or often excessive diet and irregular habits, and not infrequently to the fact that many men were in the habit of working continuously during the whole year without taking a proper holiday or sufficient rest and change at regular intervals from their labours.



THE BISHOP OF LONDON AT SEVENTY-ONE

Tennis is his favourite form of exercise.



LORD BALFOUR AT EIGHTY

He still plays a vigorous game of tennis.

Perhaps one of the most healthy means of spending those years not necessarily actively engaged in professional or business occupation is in occasional sea voyages. So many of the shipping firms provide comfortable accommodation at a very moderate price. The life on board ship affords mental and physical activity quite sufficient to keep the body and mind in health and in the full enjoyment of nature.

With a considerable proportion of men who have reached 60 or 65, some marked disability exists, due, as already stated, to previous indiscretion or ignorance. An immense amount of benefit can be derived in spite of this, and much discomfort, disease, and misery avoided, if extreme care is taken in the matter of food, the avoidance of constipation, and generally in establishing cleanliness of the gastro-intestinal tract. This can be done effectually by learning the simple laws of health and by obtaining sound information on the science of dietetics.

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THE ELDERLY WOMAN

By **GEORGE SOMERVILLE, M.D., D.P.M.,**
Deputy Medical Superintendent, West Ham Mental Hospital.

THE wheels of life run fast or slow according to climate and constitutional variation. In women the climacteric or change of life may be regarded as a milestone on the frontier of the "no man's" land which lies between middle age and old age. This intervening phase may be conveniently regarded as the elderly age. In figures, it may be expressed as lying between the years of 55 and 65, but this definition is elastic: a rigid period cannot be fixed.

The change of life is a troublous phase for most women, and this is not surprising when it is realised how profound is the organic upheaval which takes place at this time. Consequently the middle-aged woman looks forward with a happy expectation to the cessation of her trials and discomforts, and yearns for the stability of mind and body which characterises the elderly age. No longer does she regret that her sexual and reproductive capacities have receded, or that she cannot play the active part in life which once she did: a pleasing equilibrium which never before has she experienced—for until this stage woman's life has consisted of a series of minor and major crises—leads to the adoption of a philosophic attitude and a recognition of her true place in the scheme of individual existence.

In contrast to men, this age in women is not beset by the problem of retirement, with its dangers and anxieties. The majority of elderly women, though incapable of severe exertions, maintain in a modified form and according to economic circumstances the working routine of their lives. Women are thus unlikely to indulge in idle luxury, or to fall victims to the boredom of wasting time.

The general health of the body at this age depends largely on the vitality of the nervous and circulatory systems, and, while the hereditary factor is of fundamental importance, the influence of undue strain or chronic disease

—especially self-poisoning—must be kept in view as an index of the prospects of a fit and happy elderly age. A gradually rising blood-pressure is common at this age and tends to strain and eventually thicken the arteries. A restriction in effort, mental and physical, and extreme moderation in matters of food and drink, are simple measures which, if adopted in time, stem the advance of ageing arteries and prevent the likelihood of the rupturing of a brain blood-vessel.

With diminishing bodily activity and sluggishness of the muscles and glands of the intestines, constipation, with its evil train of consequences, is apt to ensue. This state calls for urgent treatment, for chronic constipation must be avoided at all costs. Suitable dieting, along with appropriate exercises, and, if need be, massage of the abdomen, are valuable natural means to remedy the defect. Purgatives should only constitute a last resort: it will be found that the elderly do not respond promptly to the drug and that considerable quantities are required.

The occurrence of cancerous disease in the special reproductive organs, breast and womb, is liable to show itself in the early elderly period, and a word of warning is necessary. A lump in the breast or a blood-stained discharge, even if both are painless, necessitates *immediate investigation* by a doctor.

In the late elderly age of women, ailments common to all phases of life may occur—notably pneumonia and erysipelas—but as a rule they are less acute and more prone to be latent. The importance of periodic medical examination at this, as well as other ages, is clear.

The general intensity of the emotional life is lessened after the menopause and, although this leads to a lowering of the conscious affection of man and wife, in most cases, there is substituted an increased bond of friendship and comradeship which adequately compensates for the faded sexual love. In the absence of a husband's companionship, a mother should seek outlets in social work, and should

General
Health.

Mental
Health.

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not endeavour to derive an excessive affection from her children, for this can only lead to unhappiness and family discord.

Will power and imagination are diminished in vigour, but the occasions for their exhibition in full strength are few and the fading of these qualities is not missed. The vain regrets of years not distant are lost, and a period of mental peacefulness and calm makes life agreeable and pleasant.

Following on the climacteric, the elderly age naturally depends upon the successful weathering of this crisis. If health has been

maintained throughout that period by correct living, there is no need for any special regimen for the elderly age.

Hygiene. Temperance in diet, along with a careful selection of foods, modified exercise, strict attention to the state of the bowels, avoidance of mental excitement and unusual physical exertion, ensuring sound sleep at night and periods of rest during the day, and, finally, periodic medical examination, are the measures to be adopted to achieve a healthy elderly age for all women—the best antidote against old age.

OLD AGE .

By **GEORGE SOMERVILLE, M.D., D.P.M.,** Deputy Medical Superintendent, West Ham Mental Hospital.

MAN enjoys a longer average duration of life than most animals, though there is considerable variation in longevity in different races. The Kalmucs and Hottentots, for example, age rapidly and die comparatively early.

The life of man is limited and defined. From a fertilised germ cell the human infant is evolved and born. Then follows a phase of growth and development, which eventually culminates in physical, sexual, and mental maturity. This is the period of greatest activity, intellectual, physical, and reproductive. New life is created; new thought is given to the world. Then

succeeds a waning of biological function. The individual has served his purpose in life: Nature has no further use for him, and the vigour of the life-force fades. Ruthlessly,

Nature seeks his extinction, as though he were a parasite; yet, kindly, she permits a period of grace, old age—a preparation for dissolution—in- evitable death.

By old age or senility is signified a gradual abatement of the physiological processes of the body. It is associated structurally with a universal tendency to wasting and degeneration of the highly specialised cells, and their replacement to some degree by a lower form of tissue, usually of a fibrous



[E. O. Hopf]

DARBY AND JOAN
A typical study of old age.

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nature. Presuming that there is no hereditary defect, and that the individual has not been subjected to any special strains or diseases, the functions of the mind and body, with the exception of the reproductive, should fail gradually and simultaneously, with the result that death should arise, not from disease, but as the climax of physiological extinction. During this process the aged should lose the instinct for life, and, having fulfilled the cycle of life, should acquire an instinct for death. To the normal aged, death should not appear as a grim, devouring spectre; it should seem the final realisation of life and should be as welcome as sleep.

Unfortunately, physiological senility is comparatively rare. Few are born organically perfect: few are not subjected to stresses and strains which impair the vitality of the tissues: few have not suffered from diseases which distort the harmony of body functioning. Constitutional weakness, degenerative diseases of the heart and blood-vessels, and chronic poisoning from the kidneys, bowels, or liver are the three great dangers to normal senility.

Morbid old age may be regarded as a caricature or exaggeration, often prematurely, of normal old age. There is no dividing line between them; they gradually merge into each other.

SYMPTOMS AND SIGNS

It is impossible to fix an age at which the symptoms and signs of senility first manifest themselves. To some extent it depends on the hereditary factor (longevity runs in families), and on the actual circumstances of life. Some men are senile at 50; others may preserve the vigour of maturity till 60. Idiots and imbeciles age rapidly and die early. In white races signs of approaching senility are usually obvious when the age of 65 is reached.

The bodily accompaniments of old age are related to a universal lowering of tissue vitality and a gradual failure in nutrition. A most important and far-reaching change is the insidious replacement of the muscle fibres of

the heart and arteries by fibrous tissue. The heart loses its efficiency as a muscular pump and the arteries lose their elasticity, with the result that the general circulation is impeded. Consequently the blood is insufficiently oxygenated and the tissues are not supplied with the requisite amount of nourishment. Chronic kidney disease, alcoholism, syphilis, and gout are factors which hasten this arterial and cardiac degeneration, and are therefore important causes of premature senility.

Eventually lime salts are deposited in the walls of the arteries and they become brittle and liable to rupture (arterio-sclerosis). One of the poorly supported vessels in the interior of the brain may burst and an "apoplexy" results, which, if not fatal, leaves behind a muscular paralysis of one half of the body. Tiny capillary hæmorrhages in the brain are the cause of the shuffling, short-stepped gait often seen in the aged. Painful cramps in the legs are apt to come on after walking some distance, owing to insufficient blood reaching the muscles during their activity. When the arteries become very thickened, gangrene or local death of tissues (usually of the foot) may arise. The small capillaries in the kidneys share in the general arterial degeneration, and naturally the kidney function is deranged. Poisons normally excreted are retained in the blood stream and cause further deterioration in the arterial system. A "vicious cycle" is set up, and practically every tissue and organ of the body suffers in consequence. Truly, "A man is as old as his arteries."

The outward signs of senility are familiar to all. "Last scene of all!" There is loss of flesh, especially in the limbs and face. The skin loses its firmness and elasticity and becomes wrinkled; the hair becomes scanty. The eyes are sunken and a whitish-yellow arc appears round the margins of the cornea (*arcus senilis*). The muscles are soft and wasted—all movement is tremulous. The bones are brittle. The aged are unable to stand upright, and there is an apparent diminution of stature: this is due partly to

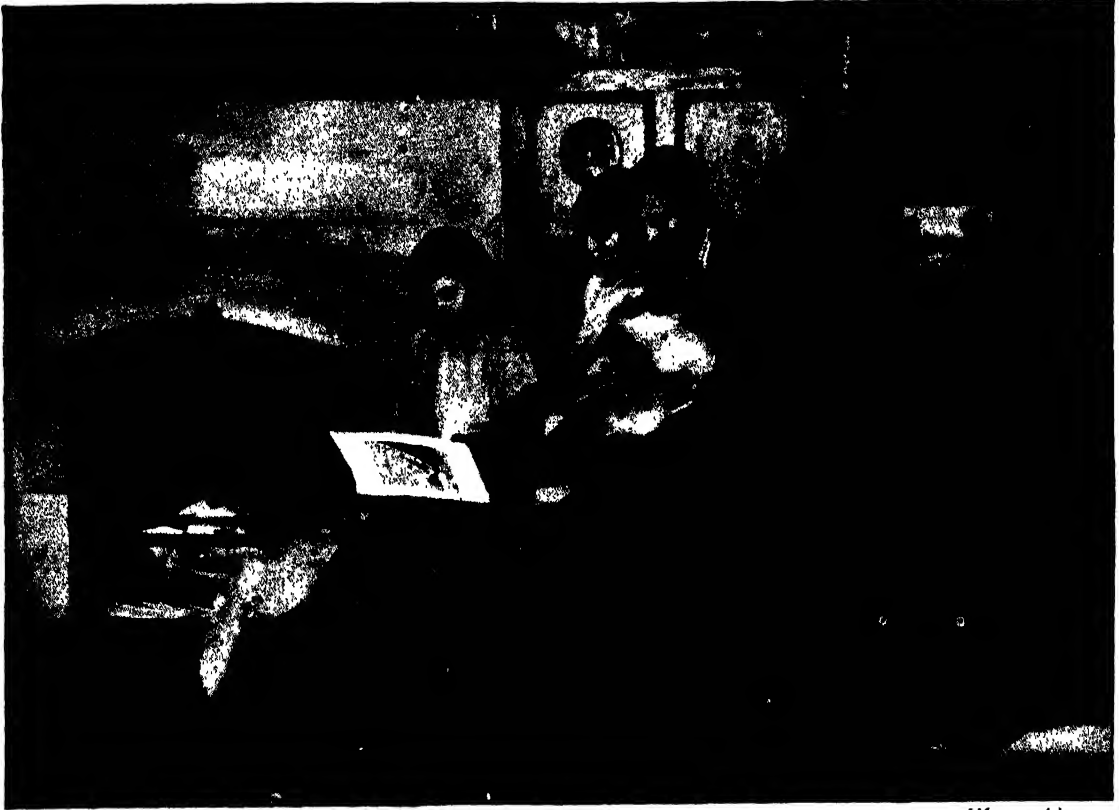
**Bodily
Changes.**

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muscular weakness and partly to flattening of the intervertebral discs. Vision is dimmed owing to opacities in the transmitting media of the eyes and to weakness in power of accommodation. Hearing is diminished owing to fibrous thickening of the delicate receptive membrane of the ear. Urine is passed too frequently, and this is caused by inefficient kidneys or, in men, by enlarge-

devolve in regular sequence. As a rule, a failure in memory is the first evidence of mental deterioration. The senile mind dwells in the past; incidents of long ago are well remembered—too well, for it leads to tedious repetition—but recent events tend to be forgotten. With diminished power of attention and concentration, it is natural that

Mental
Changes



"CRABBED AGE AND YOUTH"

[Marcus Adams]

It is a rare gift for old age to be able to maintain its touch with youth, for its understanding is often obscured by envy and by the difficulty of finding points of mutual contact.

ment of the prostate. The sexual function is diminished or lost.

It is interesting to note that the senile, though prone to suffer from bronchial and lung inflammations, are comparatively immune to cancer, and should such a tumour arise it is characterised by its slow growth and relative benignancy.

The mental changes of senility are no less characteristic than the physical. As in childhood the mental attributes evolve in definite order, so in old age they commonly

current happenings make little impression on the memory.

A diminution of mental energy leads to a loss of originating or creative power. There is poverty of ideation and a lack of coherence in the train of thought. Sustained mental or physical work becomes impossible. The will is weakened or distorted: the petulant obstinacy of old age is well known. Emotional response is less keen: old people accept with complacent indifference news or happenings which previously would have



THE OLDEST INHABITANT

[Judges Ltd.]

A hardy old countryman—a product of the simple open-air life.

led to extreme joy or sorrow. At the same time the control over the exhibition of emotion is lessened: the advanced in years laugh or weep on little provocation and are unduly sentimental.

As the intellect gradually weakens, reasoning power and judgment deteriorate. The senile become wayward, peevish, and querulous, ready to take offence, suspicious, changeable in their affections, self-centred, impatient of contradiction, impulsive and choleric, jealous of the young.

Mental decadence, represented in the natural failings of old age, may reach a certain degree and remain more or less constant, or it may become more pronounced when a state of dementia or mental disintegration eventually ensues. In such

a condition care and supervision become essential. Such persons tend to become sleepless, restless—constantly getting in and out of bed at night—and excitable. With approaching dissolution the senile take to collecting rubbish, return to the age of make-believe, and eventually become wet, dirty, and bed-ridden. These cases have definitely passed over the border line between normal and morbid senility.

Certain forms of mental disease may complicate the senile period. Melancholia, with delusions of persecution and destitution, mania with restless excitement and attacks of confusion, are fairly common. Though recovery may take place in some of these cases in a remarkable way, it is often found that the mental deterioration has made more rapid progress. A troublesome symptom is a morbid sexuality which, in men, is accompanied by an enlarged prostate, but which is actually caused by a defect of inhibitory power, and not by an exaltation of sexual desire. Obscenity in conversation, shamelessness in conduct, and sexual derelictions may blot the closing years of one

who has led a blameless and honourable life. This symptom is obviously of considerable medico-legal importance.

Though there is no possibility of recovery and little likelihood of arresting true senile dementia, a great deal can be done by way of careful nursing to render the final years of life comparatively restful and contented. Tactful and discreet management by a skilled nurse will calm excitement, hasten away depression, and relieve fears. The senile are as responsive to friendly care and as appreciative of attention as children.

The mental changes in senility are accompanied and related to certain morbid changes in the brain—the organ of mind. There is a general shrinkage in the size of the brain visible to the naked eye, and the

THE SEVEN AGES OF MAN

blood-vessels which supply it with nourishment are tortuous and thickened. Microscopically, the brain cells are diminished in number, and many show evidence of degeneration.

THE ENDOCRINES AND SENILITY

A certain similarity in general appearance between cases exhibiting deficient thyroid secretion and cases of senility, and the influence of the sex glands in maintaining physical and mental vigour (proved by rejuvenation experiments), have led to the belief that the general decadence of old age is related to defective endocrine functioning.* Also, the effects of prolonged and intense emotional activity have long been regarded as contributing to early senility, and recent experiment has shown that these changes are related to a great increase in the output of adrenalin. This must inevitably be followed by an exhaustion of the gland and a diminution of its hormone.

The endocrine glands, like all other body organs, participate in the general abatement of function characteristic of old age, but it seems probable that in certain cases of *premature* senility the chief instrumental factor is a general failure of endocrine activity.

THE HYGIENE OF OLD AGE

Among the physical exciting causes of old age have been mentioned chronic degenerative diseases of the heart and blood-vessels and chronic intoxication as a result of kidney inefficiency. Gout, syphilis, excessive alcoholic indulgence, and lead poisoning are common causes of such conditions, and their prevention would unquestionably hinder the

* "Endocrine glands" is a term applied to certain organs whose function is to secrete into the blood or lymph a substance which plays an important part in connection with general chemical changes, or with the activities of other organs at a distance. (See section on "Endocrines" for Rejuvenation and Arrest of Premature Senility.)

onset of premature mental and physical decay.

Auto-intoxication resulting from chronic constipation, with stagnation and putrefaction of the bowel contents, inevitably reduces tissue vitality, and is a factor in the production of senility. Metschnikoff regarded this self-poisoning as an essential cause, and recommended the taking of sour milk containing lactic acid bacilli with the object of inhibiting the growth of the putrefactive bacilli which flourish in intestinal stagnation. Auto-intoxication is also related to endocrinal activity: the presence of circulating poisons calls for increased functioning of the internal secretory glands, and may prematurely exhaust them, and thus further hasten the senile process. To some extent substitution of gland extracts may retard the onset or alleviate the symptoms of



A FINE OLD AGE

[Typical

One of the last photographs of Dame Ellen Terry, who was the idol of the theatre-going public for nearly three-quarters of a century.

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old age, but precise scientific information on this subject is not yet available. The transplanting and grafting of active sex glands as a cure for senility is still under trial. The most useful application of endocrine therapy would appear to lie in the prevention and not the cure of premature old age.

Dr. Leonard Williams has expressed this conclusion admirably, as follows :

"My point, however, is that the operation ought never to be necessary. Under the present dietetic dispensation there will always be hundreds of people whom it will benefit enormously ; but if such people had only paid a due respect to the purity of their *liquor sanguinis*, the necessity for grafting would never have arisen. The best measure of rejuvenation is a thoroughly depurated blood-

supply, and the best means for securing that is to practise moderation punctuated by fasting. It is better to find salvation in a dietetically sober and righteous life than to seek to conjure back competence by a cutting operation."

The mental hygiene of old age is a controversial subject. In spite of the com-

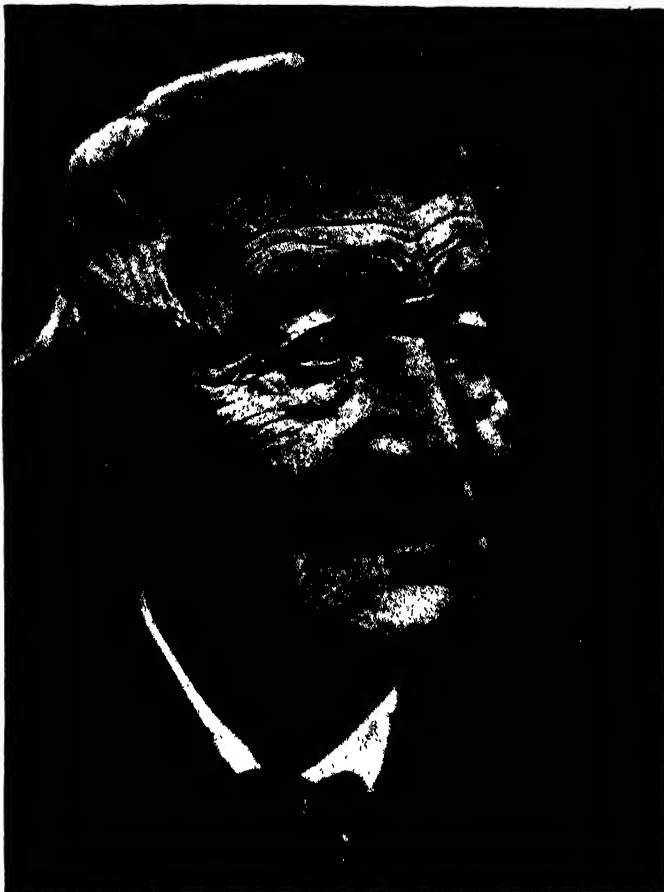
plexities of modern civilisation and the increase in adaptations thus necessitated, the average longevity is increasing. This may be attributed to a general amelioration in social conditions ; to the greater interest taken in the study of the maintenance of health, and to the advance of public preventive medicine.

The development of a philosophic attitude to life during the years of mental robustness is an investment against the discontent of old age. An interest in life may be maintained by hobbies or other pleasing recreations of the mind and body. Loneliness must be avoided : it arouses moodiness and selfishness. Pleasant company does much to preserve mental equanimity.

Clouston emphasises right treatment of the body as a

means of ensuring mental health during the decadent period thus :—

"Gentle exercise, fresh air, not too great exposure to cold, right diet, well-cooked, non-stimulating, and easily digested, will do much for the old man's or old woman's mind. I preach much milk, little flesh, and a very small amount of alcoholic liquor of any sort."



A STUDY IN WRINKLES

[L. O. Hoppé]

III

MOTHER AND CHILD

THE CALL OF THE MOTHER

By *THE LADY EMILY LUTTENS.*

THE future of the world lies with the mothers of the world, and this is true from whatever point of view we may consider it. If we regard it purely from the standpoint of health it is the mother who, by her knowledge or her ignorance, can make or mar the health of her children. This is equally the case with regard to the mental and emotional outlook of children. As the little body is moulded in the womb of the mother, so are the thoughts and feelings of her children consciously and unconsciously moulded by her.

Every girl is a potential mother, and this fact alone should make her sacred; but when women themselves set aside their high prerogative, can they wonder if men abuse it?

Motherhood is a vocation in a sense that fatherhood can never be. The prospective father can hand on to the coming genera-

tions a heritage of weal or woe, of disease or health, and this racial responsibility is one which should be impressed, by education, upon the growing boy. But motherhood is

a vocation of a different order; it begins with the conception of the child, but it does not end till death. The man passes to the woman the great gift of life, it is hers from henceforth to nourish and sustain. It is the right and duty of the mother to educate and train her sons in their racial duty, so that even right fatherhood depends very largely upon the right fulfilment of motherhood.

All women are not born mothers, but there are many to whom motherhood is the highest and

holiest vocation, the fulfilment of their being. The possibility of tragedy for such women is threefold. Either they are denied maternity for lack of a husband—and there are thousands of women in this position



[*Marcus Adams*]

MOTHER LOVE

The tender early years require all mother's care and devotion.

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[Topical

POTTERY MAKING AS A HOME INDUSTRY

A fascinating occupation which enables women to earn money in their own homes.

in England to-day—or maternity is thrust upon them till mother love is almost crushed beneath the burden of the growing family and resulting ill health; or, owing to the pressure of economic stress and the present high cost of living, the woman is driven to increase the family income outside of her home, with the resultant neglect of the children, or artificial limitation of the family.

There seems to me to be but one remedy for this state of things—the recognition by the State, by means of endowment, that motherhood is a vocation and that in perfectly fulfilling that vocation woman is at the same time fulfilling her highest duty to the State. A revival of home industries, such as is being encouraged by the women's institutes, might also help to solve this problem by enabling women to earn money without leaving home.

If motherhood is to be recognised for what it is—a highly specialised vocation—it will be realised that adequate education and train-

ing are necessary. Training is considered necessary for every profession in the world, but it is supposed that every ignorant boy and girl can understand, unaided, how to carry out the supremely difficult and intricate duties of parenthood. Training for parenthood, and especially for motherhood, racial duty, and responsibility, should be taught in all schools.

All great religions have embodied the idea of the Divine Mother. Has not the time come to translate this conception of Divine Motherhood into terms of human motherhood, and to recognise the Divine Mother in every human mother? .

Woman fulfils herself most truly in her children. "Men have created great works of art; women have created men." Most great men have borne testimony to what they owe to their mother, and if we want once more to produce a race of gods and heroes, we must begin by the training of the mothers who shall be worthy to bear them.

MOTHER AND CHILD

ANTE-NATAL CARE

THE NEED FOR LESSENING MATERNAL MORTALITY

*By Sir W. ARBUTHNOT LANE, Bart., C.B.,
M.S., F.R.C.S.*

As a nation we are proud, and justly proud, of the very great decrease in the infantile mortality rate. In 1900 the infant mortality rate in England and Wales was 156 per 1000 births. In 1926 it was 70 per thousand. This is a tremendous step forward in the improvement of the health of the nation. A lower infant death-rate also means fewer sick children during the period of infancy, which implies stronger and healthier citizens of the next generation. With a steady increase in the number of maternity and child welfare institutions by means of which health teaching is given at the welfare centres, and in the homes of the people, a still further decrease in the death-rate should result.

But what about the maternal mortality rate? Alas! In spite of all the teaching given, the maternal mortality rate has shown very little change during the last twenty-six years. In 1900 the number was 4.69 of every thousand births, and in 1926 it was 4.12. This is a very serious thing, especially when we realise that it means that not less than 3000 women die annually from this cause. So serious is it that every man and woman should give thought to this problem, and strive his and her utmost to give support to those who are trying to solve it.

Much investigation is being carried out, but so far no one cause has been assigned for this heavy mortality in connection with child-bearing. Those who have specialised knowledge and who are capable of forming an opinion, are inclined to believe that more than one factor is involved, and that the death-rate is due to a number of causes. But be they few or many, they must be ascertained and abolished at whatever cost, before we, as a nation, can feel that we are making progress towards racial health.

Improvement can only come by (1) the

education of both mothers and fathers in personal hygiene and in the hygiene of pregnancy, and (2) in teaching the absolute necessity of supervision of the health of the expectant mother. The majority of parents now realise the full importance of special care for children during the first few months of life, and the result of this care is shown in the lowered infant mortality rate, but very few seem to understand the imperative importance of care and supervision of the health of the mother during the ante-natal period.

There are ante-natal clinics attached to many hospitals, and there are infant welfare centres in every town. The difficulty is to get the prospective mothers to attend the former. The majority of mothers, especially the young ones, are shy, and do not like to attend the clinics, especially during the early months of pregnancy. Yet it is just in these early months that supervision is so essential. If the fathers could be taught how the health of the mothers is affected by pregnancy, and how some of the minor ailments, often neglected because they are minor, can, if left unattended, become of great danger during labour, they would exercise their influence and persuade their wives to attend the clinics. Every right-minded man is concerned for the health of his wife during the time of pregnancy, and any suggestion that he can make to her as a result of his concern will have more influence with her than the suggestions of any other person. For this reason alone it is essential that the fathers should be educated on this subject.

THE ANTE-NATAL PERIOD

*By ETHEL BROWNING, M.D., Ch.B., late
House Surgeon, Liverpool Stanley Hospital;
Assistant School Medical Officer for Liverpool;
and Medical Officer, Infant Welfare Centre,
Garston.*

EVERY mother who wishes her child to become a healthy specimen of his race must be, and generally is, prepared to expend an

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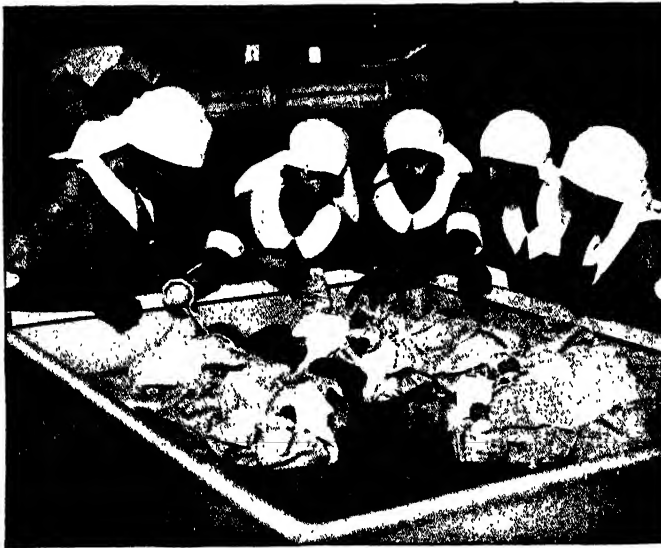
infinite amount of care and trouble in attending to his bodily needs. When she realises that the actual process of birth is not the point where the child begins life itself, but only the moment when he takes it up as a separate existence, and that she can extend her protecting influence over him for many months before she can actually exercise control over his bodily activities, she will be eager to learn how to care for herself during these months in order to transmit such an influence to him.

From the moment of conception to the moment of birth this development of the embryo, or potential child, is a stupendous achievement. From a single living cell, not more than about four-hundredths of an inch in diameter, growth and subdivision take place, with the formation and specialisation of all the different organs, until a fully formed human being takes his place in the outer world, his body, which during nine months has increased in weight nine hundred million fold, already adapted to the needs of his environment.

During these nine months the embryo, or, as it is called after the sixth week of pregnancy, the foetus, is nourished by the mother in a much closer and less detached way than after birth. The structure which enables this process of nourishment to take place is called the placenta, a round mass of tissue attached to a part of the wall of the womb on one side and to the membranes which enclose the embryo on the other.

The more fully developed foetus becomes tethered to the placenta by the umbilical cord, which has to be severed after birth. The placenta contains open spaces in its tissue on the side attached to the womb, which are in contact with corresponding tufts or projections on the side attached to the embryo, and in this way the blood of the mother is brought into close relation with the blood of the growing child, so that substances can pass from one to the other. These substances include food and oxygen from the mother to the

child, and waste substances from the child to the mother. It will be seen, therefore, that anything which tends to impoverish or poison the blood of the mother will tend to have a corresponding effect upon the blood of the child, and, in fact, it has been proved that poisons such as lead and excess of alcohol can be transmitted



Special Press

EXERCISE TIME AT A DAY NURSERY

Babies in the kicking-pen at the Mothercraft Training Society, Highgate, where lectures and demonstrations are given to instruct mothers.

from the mother to the child.

It must be remembered that the relation of the parents to the child before birth includes the influence of heredity. Certain conditions of physique and mentality are inherited by the child from one or both of its parents, and though the transmission of disease in this way is not completely understood, enough is known of the influence of insanity and tuberculosis to make it clear that no mentally deficient person, nor one suffering from uncured venereal disease or from active tuberculosis, should on any account bring children into the world, and that those who have a history of mental trouble

**Mother
nourishes
Child.**

MOTHER AND CHILD



A BABIES' WARD

Babies of all ages are received here and advice is given to the mothers.

in close family relationship would be wiser and more unselfish to abstain from doing so.

THE PREVENTION OF MATERNAL AND INFANT DEATHS

By Professor A. LOUISE McILROY, D.B.E., M.D., D.Sc., Ch.B., Professor of Obstetrics and Gynaecology, University of London; President, Maternity and Child Welfare Group of the Medical Offices of Health.

DURING the war the State awakened to the fact that the prevention of infant mortality was not only concerned with the health and social welfare of the child but that the care of the expectant mother was equally important. Dr. Ballantyne, a very eminent maternity specialist in Edinburgh, had spoken and written on this subject for years, but it was with great difficulty that he ultimately impressed upon the medical profession the benefit to be derived from the treatment of women and their unborn children. In a small clinic in the Edinburgh Maternity Hospital the work had its origin, and now ante-natal care has come to be recognised as one of the most important branches of National Health Service.

It is not only the treatment of disease that is essential, but of greater benefit to the individual and the community is its prevention. If a child is born well developed and healthy it has a much greater chance of surviving and of escaping disease than one that is born in a weakly and puny condition.

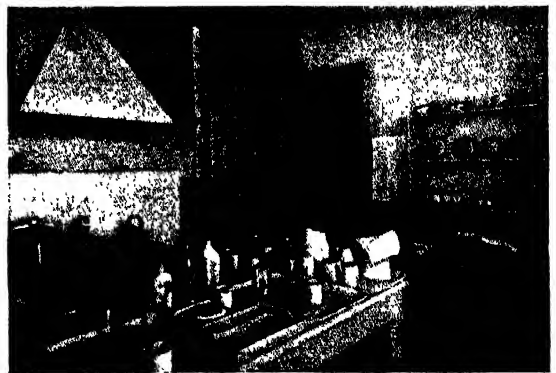
There are three very important aspects of ante-natal care. (1) The health of the

mother during pregnancy. It is obvious that a healthy mother will in all probability produce a healthy child. (2) The prevention of wastage of child life by reason of miscarriages and premature births. (3) The supervision of the expectant mother in order to prevent or relieve the complications and difficulties associated with labour, which might cause death or subsequent ill health of the mother and child.

Pregnancy in the majority of cases has a beneficial effect upon women. Given proper housing conditions and suitable diet the average woman should have no fear of undertaking maternal responsibilities.

A considerable number of deaths occurring during and after confinement are due to poisons in the blood which give rise to convulsions and to severe haemorrhages. Sepsis, or blood poisoning, occurs after labour, and is due to lowered resistance and to difficulties and complications during labour. Serious operations can be rendered safer or even dispensed with in many cases if supervision of the expectant mother has been carried out. Treatment of sources of infection such as discharges, sores, etc., reduce to some extent the onset of sepsis.

Haemorrhages also can be prevented to a great extent by attention to the kidneys and bowels. In short, with a thorough knowledge of the condition of the patient, the doctor is far more capable of dealing with the confinement than in the case where the patient has been seen for the first time during labour.



BABIES' MILK KITCHEN

The utmost care and exactitude are necessary when preparing a baby's food.

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CHOOSING THE NURSE

By *THE VISCOUNTESS ERLEIGH, Vice-President, The National Society of Day Nurseries.*

ALL authorities are agreed that the training of the child cannot be begun too early, in fact, should commence from birth, and the first month of a baby's life is certainly one of supreme importance. During this month the baby is generally under the care of what is popularly termed the "monthly nurse," and her influence for good or evil in the household is enormous. Apart altogether from the technical ability to do her work efficiently as regards the mother, her influence on the mental condition of her patient is all-important. An atmosphere of calm, confidence, and peace is equally necessary to the well-being of both mother and baby.

For the successful establishment of breast feeding, such an atmosphere is essential, and unless the monthly nurse is convinced herself of its importance, the chances of success are small. Some nurses are never really happy unless they have the baby on bottle-feeding, and use every little difficulty that arises to further that purpose. It is wise, therefore, for the mother to question a nurse very carefully, on that point before engaging her, and further to ascertain if she has any knowledge of the simple means, now well known, used to maintain and increase the supply of breast milk. Unfortunately, there are still to be found nurses who are without this most necessary knowledge.

A mother should also ask her nurse for her opinions on the training of infants. If the right foundations are laid during the first month in matters such as sleep, regularity of the bowels, the absence of night feeding, etc.,

the baby will be easier to manage and will make better progress, than if, as sometimes happens, the second month of baby's life is passed in breaking him of habits acquired in the first. There is so much that a nurse can do to place both mother and baby on the right lines, that too much care cannot be exercised in the choice of the right person who possesses really up-to-date knowledge of infant care and management.

All those who are thinking of engaging a college-trained nurse should make inquiries whether she has been trained at a college affiliated to the Association of Nursery Training Colleges. They would then be sure that she has received the best possible training. There are many only semi-qualified institutions, which purpose to send out trained nursery nurses, and employers should make careful inquiries before engaging a nurse from such sources. A nurse from a properly conducted college receives a certificate on the completion of her training, and the employer should always ask to see this.



VISCOUNTESS ERLEIGH

Very excellent nurses are also to be obtained from the National Society of Day Nurseries. These nurses get an excellent practical and theoretical training, and receive certificates if proficient. The younger girls from the society often go out as nurserymaids in taking up their first posts.

The advantages of having a trained nurse are many. One advantage is the training received in breast feeding which some colleges give. It is an inestimable advantage to the mother to obtain a nurse who has had some experience in this subject and can help her in small matters of detail and routine.

MOTHER AND CHILD

THE EXPECTANT MOTHER

By **MABEL LIDDIARD**,
Matron, Mothercraft Training Society.

PREPARATION for motherhood should be begun in the very early days of married life, or even earlier. The girl of the present day comes to her wedding far better equipped with knowledge than did her grandmother, and rightly so, as ignorance is not the best foundation for happiness, but in many cases she still lacks the knowledge which will enable her to make the time of pregnancy a joyful expectation of a natural event.

Mothercraft is a science which can be taught and which is not instinctive. The instinctive love which every mother has for her offspring is not sufficient to provide means to overcome difficulties unknown in the natural state. Practical experience is the best teacher, and any girl about to be married should try to obtain it if only for a very short time.

Many centres are now offering classes to engaged girls and young mothers, and far more is learnt from these than by studying any number of books. Demonstrations are given, so that when her first baby arrives the mother will not be afraid to bath him lest her clumsy handling should injure him. At these centres the expectant mother can be put in touch with the health visitor or district nurse and so can be helped in many ways with her preparation. The time is very near when ante-natal clinics will be

within the reach of every woman, with resulting decrease in the risks of maternity. Many difficulties at the time of labour are due to the fact that advice is not sought early enough for precautions to be taken.

The well-established belief, still prevailing, that a woman should expect all manner of troubles during her pregnancy, has been refuted. Pregnancy is not a time of illness or invalidism; it is the natural fulfilment of a normal function, and therefore a time

when a woman should be at her best, with every faculty alert and her whole body full of life and energy. For this reason it is quite wrong for the young mother to deprive herself of all pleasurable recreation. She may continue to lead her ordinary life as far as possible, though with a little extra forethought, so as to ensure rest and exercise. Tennis, dancing, and other recreations can be continued between the third and sixth months with care-



MABEL LIDDIARD

[By Keimrah Collins]

ful avoidance of over-exertion (unless there is any reason to fear a miscarriage), but new forms of sport should not be undertaken as likely to overstrain a set of muscles unaccustomed to strenuous work. Walking is really the ideal outdoor exercise, especially for those who live in the country and can take long tramps in comfortable shoes and clothes. The modern athletic girl is perhaps liable to go to the other extreme and over-exert herself. Rubbing with olive oil as recommended in old days is quite unnecessary, tending rather to soften the skin than to tone up the muscles.

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Certain definite exercises are recommended by modern obstetricians in order to improve the circulation and tone up the muscles and so lead to better health and an easier confinement. They should be commenced gradually and at first two or three minutes a day will be sufficient. Ten minutes night and morning is the full time,



EXERCISE I. FOR MOTHERS

Slow systematic bending movements of the trunk should be accompanied by deep breathing.

and they should be stopped at the first sign of fatigue.

Those recommended by Sir F. Truby King are :—*

- (1) Slow, systematic bending movements of the trunk, backwards and forwards and from side to side, and systematic deep breathing.
- (2) Lying flat on the back may be followed by elevating first one leg and then the other. This may be made easy by putting the tip of the

stationary foot under some fixed object, such as a chest of drawers.

- (3) Slow, deliberate rising from the lying down into the sitting up posture, also made easier by fixing the feet.

During the later months a belt may be found comfortable, but this should never be constricting or all the benefit derived from exercises is destroyed.

A very simple kind is made as follows : For one binder buy one and a half yards of strong material, two yards of one-inch wide webbing or strong tape, and some strong safety pins. Fold the material lengthwise four inches deep, lie flat on the bed and draw it round the body well over the hips with the fold at the bottom. The lowest part should be quite tight, leaving more room as the waistline is approached. Safety pins are the most useful fastening. Sew or pin the two yards of webbing to the back of the belt, bring them over the shoulders, crossing in front and fasten to the top of the belt. Two sets of suspenders should be attached to the fold at the bottom. Ready-made maternity belts can be obtained, but unless manufactured by some really good firm, and consequently expensive, they are apt to be boned or made of some hard unyielding material, and give pressure instead of support. If some strong cellular material is used for the home-made belt it will not be found too hot even in summer.

Suspenders should always be worn, as garters increase the tendency to varicose veins which is present during pregnancy. Tight bodices or the usual type of brassiere should be avoided. They press on the breasts and nipples, impeding the blood supply and preventing proper development, often causing depressed nipples. Many women feel the need of some support to the breasts, and these should wear some form of sling support which does not have the constricting effect of the brassiere.

The whole purpose of clothing at this time is to give warmth without weight or pressure, and with a little care and thought

* Extract from *The Expectant Mother* : F. Truby King.

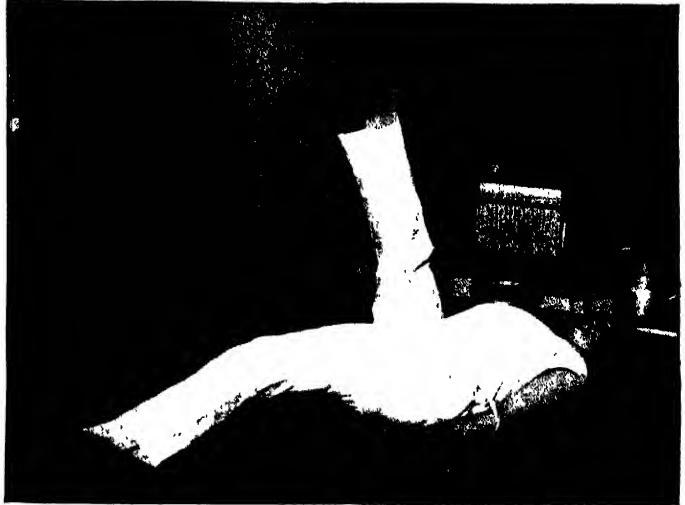
MOTHER AND CHILD

this can be achieved without having resort to slovenly ill-fitting garments. Shoes should have thick soles and preferably low heels, but the woman who has consistently worn high heels all her life should make no sudden change, since a sudden change to really low heels would probably result in foot troubles. Flat foot is not an uncommon trouble in pregnant women, owing to the alteration in the balance of weight, and it is always more frequent with those who wear high heels.

For many expectant mothers the need for rest is far greater

than the need for exercise. Housework at the present day occupies a very large portion of most women's lives, and housework is not an engrossing pastime to every one. In moderation it is an excellent form of exercise, but must not be made an excuse for missing the daily walk. The latter ensures the fresh air and change of environment so essential for the expectant mother, who is sometimes a little inclined to grow depressed and morbid if she stays indoors and wrestles with her household problems. A companion should always be found for her walk if possible, as it is obviously difficult to brood over troubles, real or fancied, if some one is present to distract the attention.

A midday rest of half an hour at least should be taken regularly, and then this good habit will not be set aside after the baby's birth when it is even more necessary. Even the busiest mother will make some of the layette herself, and this is as easy to do on a sofa as on a chair. When warm enough the rest should be taken out-of-doors or at least by the wide-open window. The extra demands made on the body necessitate more oxygen for the blood and therefore



EXERCISE II.

Lie flat on the floor and raise first one leg and then the other.

a plentiful supply of fresh air is essential. Bedroom windows should always be open, and in summer every opportunity of sitting out-of-doors should be taken.

A bath should be taken every day. The ideal is to have a warm bath every evening.

Those who are accustomed to a cold bath in the morning should continue to take it. Those who are unused to and who wish to acquire the habit should begin by sponging with tepid while standing in warm water, gradually

General
Cleanliness.



EXERCISE III.

Fix the feet and rise slowly and deliberately to the sitting posture.

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[Courtesy]

["Vista" Glass]

THE SUN ROOM AT A WESTMINSTER NURSERY

Every prospective mother would benefit from actual experience of infant management. These babies can be seen enjoying their ultra-violet rays through specially constructed windows at a welfare centre.

hardening themselves to the use of cold. It is one of the most excellent preventatives of the common cold, apart from the tonic effect on skin and circulation. There should be no feeling of chilliness after it, but a real, healthy glow and an increased feeling of alertness. In all ways the mother should follow ordinary rules of health and hygiene. Fanciful suggestions, such as that the hair must not be washed or that cold water is harmful, are quite foolish and may be disregarded.

Bad teeth are a great danger to a pregnant woman and through her to the baby. They cause imperfect mastication, leading to indigestion and malnutrition.

Care of Teeth.

The poisons from them swallowed with the food are conveyed in the blood stream to all parts of the body with definite injurious results. There is no danger in having a tooth out under gas, provided the doctor knows of the pregnancy, and even if unwilling to do a large amount of work the dentist will always put in a temporary filling, so as to make the mouth healthy and to prevent further spread of the trouble.

The preparation of the breasts is one of the most important matters to which a

mother has to attend during her pregnancy.

She should begin quite early Preparation of Breasts. to massage and

draw out the nipples, if at all depressed, and during the last two months should brush them twice, a day with soap and water, beginning with a soft nail-brush until they are hard enough to bear a harder brush. If she has had any difficulty in feeding previous babies, during the last two months she should also sponge the breasts twice daily for five minutes with cold water. It is very seldom indeed that a mother who pre-

pares her breasts and nipples properly has any difficulty in breast feeding. If the nipples are badly depressed they may have to be drawn out with a breast pump at first, but with patience and perseverance every mother will be successful in time. This method of hardening is far better than the frequent use of spirit which is likely to dry the skin and so cause cracking, or of ointment which makes it soft and tender.

As to food, the expectant mother should continue to eat the ordinary food to which she is accustomed, always including vegetables, fresh fruit, eggs, and plenty of water.

Diet. It is not the quantity of food which she takes but the quality which is so important. Few mothers need to take more than their usual ration of food if it is varied and provides a well-balanced diet. An extra pint of milk a day is useful and with a beaten-up egg makes a good tonic for a tired mother, but the milk must be an addition to the usual food not instead of it.

The indigestion and flatulence so frequently suffered by expectant mothers are often due to a misguided effort to "eat for

MOTHER AND CHILD

two," resulting only in increasing their own weight and with no good effect on the baby. The normal weight of the mother should be scarcely increased by a stone at the end of pregnancy. Extra fluid is a very important point. From two to three pints of water a day should be taken. This helps to relieve constipation and at the same time flushes out the kidneys, carrying away poisons from the body, so lessening the risk of albuminuria (albumen in the kidneys).

Visits to Doctor. The expectant mother should pay her first visit to the doctor as soon as she knows she is pregnant—in any case about the third month. It is a pity that

Doctor. this visit is still not regarded as essential in so many quarters, as many minor discomforts can be remedied and serious consequences averted if the mother is seen early in pregnancy. It is also advisable to make arrangements for her confinement as soon as possible so that her mind will be at rest and she can turn her attention to the preparation of layette, etc.

Once this first necessary visit is over and she is assured that all is well with her, she can free her mind of any thought of illness. It is possible the doctor will not need to see her again until the seventh month, except for an occasional examination of her urine. The latter is a very necessary precaution, and to save delay it is always wise to take a specimen with her when she visits the doctor.

The doctor may be able to recommend a nursing home, or the mother may decide to have the baby at home. Unless the house is large enough for a monthly nurse to be engaged it is usually best to go into a home or hospital for the first baby. Nursing-home fees are usually high, and careful inquiries should be made as to the extras

charged before booking. The expense, however, of a confinement at home is considerable apart from the inconvenience in a small household or flat, where there is little accommodation for a nurse.

TROUBLES OF PREGNANCY

Minor troubles are often met with during pregnancy, and it is well that the young mother should know simple remedies or she may be inclined to take them more seriously than they deserve.

Many women do not suffer from morning sickness in any way, and in any case it should not continue after the third month.

Morning Sickness. If it does so, a doctor should always be consulted, as it may be an indication of some more serious trouble. The ordinary morning sickness of pregnancy



Cowles]

[Treasure Cot Co.

TOILET NECESSITIES

Here are several small items for baby's comfort which can be obtained long before they are actually needed.

THE GOLDEN HEALTH LIBRARY

is usually increased by any feeling of constriction round the waist. Even a loosely tied tape has been known to aggravate it, and therefore all clothes should be hung from the shoulders. It is often accompanied by constipation and this may be the cause. A cup of hot tea and a few dry biscuits eaten before rising in the morning will often allay the feeling of nausea. Dressing should not be hurried, and five minutes' rest on the bed immediately before going down to breakfast is often helpful.

When there is actual vomiting some doctors order a large dose of bicarbonate of soda in water to be taken early in the day.

Heartburn, an unpleasant symptom of indigestion, can usually be remedied by sipping

bicarbonate of soda in hot water

Heartburn, ten minutes before a meal. For a

few days all liquids should be taken cold or tepid as hot fluids tend to increase the activity of the gastric glands which secrete an acid juice. Some mothers find that milk is the cause, but these can usually tolerate it in the form of Benger's Food. Constipation, if present, must be treated and attention given to general health.

For the first two months of pregnancy a slight loss of blood is often experienced at

the period time, but after the second month any loss of blood

should be reported to the doctor, and the mother should go to bed at once.

Miscarriages are occasionally brought on by sudden over-exertion, such as lifting a heavy weight to put it on a shelf above the head, but housework in moderation and normal exercise tend to prevent a miscarriage by strengthening the muscles. Patent tonic medicines should never be taken without a doctor's advice, as some of them contain drugs harmful during pregnancy.

Constipation in the expectant mother should not be neglected. It may be the

primary cause of morning sickness, indigestion, and heartburn, besides contributing to the production of miscarriage and varicose veins.

It should be prevented by natural means, such as the taking of fresh and dried fruits, green vegetables, and coarse cereal foods, such as wholemeal bread, oatmeal biscuits, and porridge. Figs, prunes, and dates are very useful, and plenty of water should be taken.

Frequent passing of urine is quite a normal occurrence during the last two months of

pregnancy, owing to the pressure on the bladder, and should not occasion any worry. Less fluid

should be taken in the evenings to avoid disturbance at night. At any time,

any difficulty in passing water should be reported to the doctor, who should also be

informed if at any time the mother fancies she is passing less urine than usual. The

examination of the urine by a doctor during pregnancy is now regarded as an essential part of the ante-natal care.

Haemorrhoids (piles) and varicose leg veins sometimes occur in pregnant women,

owing to the increasing pressure of the pregnant uterus. Both

need medical attention. Contributing causes are constipation and the

wearing of tight garters, both of which it is in the power of the mother to avoid. The

pain of the piles can be alleviated by the use of witch hazel ointment, and by taking small

doses of liquid paraffin in order to soften the stools; but medical advice should always

be sought.

In these circumstances a doctor should always be consulted at once. Swelling of

legs may be due merely to pressure, or to the varicose

veins, but swelling of face and hands needs definite medical

treatment.

Cramp may be very troublesome at night.

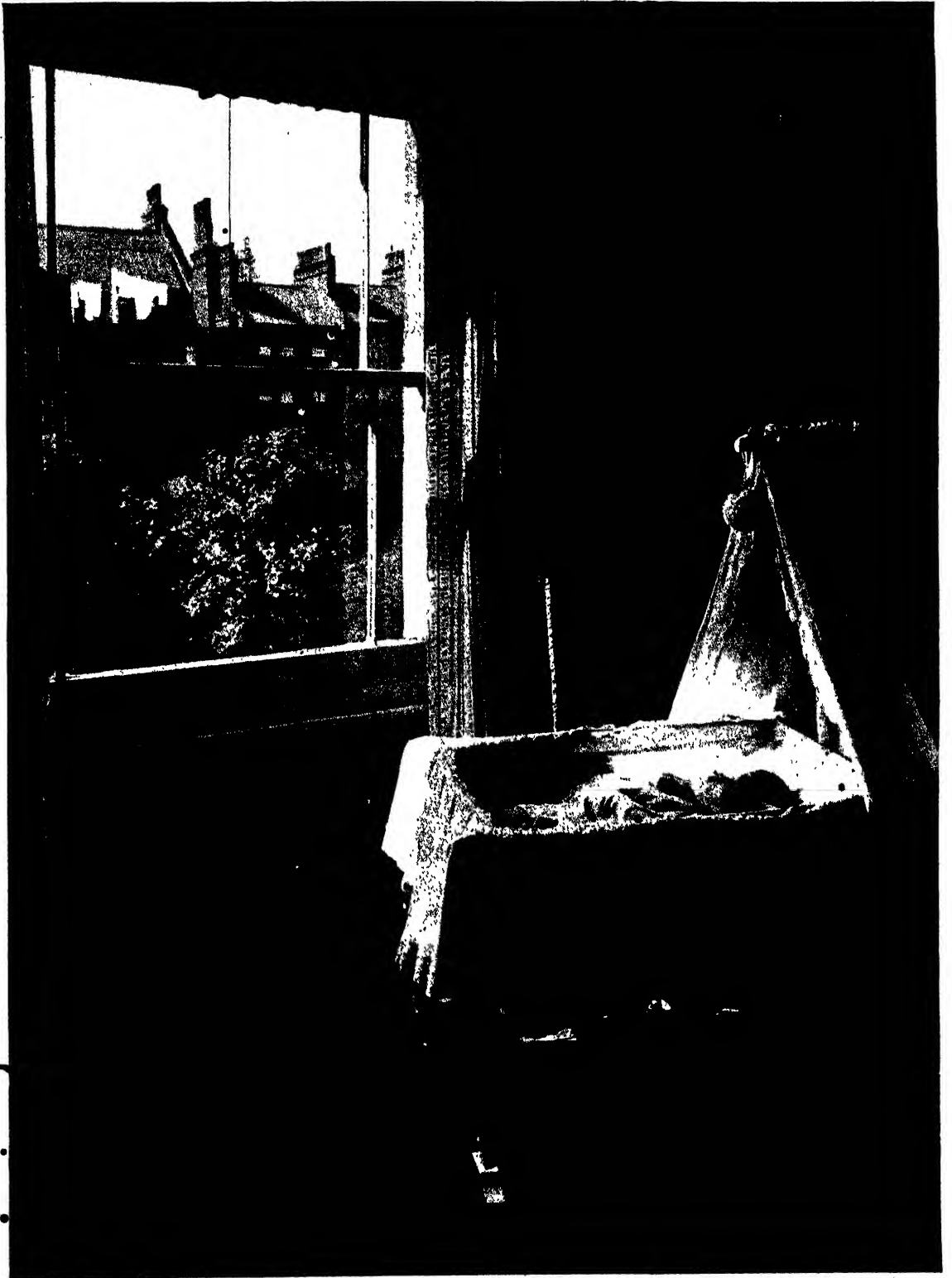
It is usually caused by pressure on the nerves, and is alleviated by gentle

Cramp. massage, *always rubbing towards the heart*. Application of flannels,

wrung out in cold and hot water alternately, will often relieve it. Cramp can often be

relieved by standing on tiptoe, or by straightening the toes if in bed.

MOTHER AND CHILD



Courtesy

["Vila" Glass]

FULFILMENT

To the mother equipped with knowledge, the time of expectation should be a joyful preparation for a natural event.

WHAT TO PREPARE FOR THE EXPECTED BABY

By MABEL LIDDIARD, *Matron, Mothercraft Training Society.*

THERE is no need for anxiety as to the preparation of a layette. Modern hygiene and up-to-date methods of clothing all tend towards simplicity, and the mother who spends her time and money wisely will find that she is able to provide a completely satisfactory outfit, including, if she is so inclined, dainty embroidery and stitchery.

LAYETTE

Present-day baby clothes are within every one's power to make, and the mother who buys her layette ready-made, not only misses a great pleasure, but incurs unnecessary expense. Where expense need not be considered, there is little objection to knitted clothes from birth, although woollen garments have the disadvantage of being apt to become hard and felted when frequently washed, and of being easily penetrated by cold winds. A small baby rapidly outgrows the first dainty sets; it is really better therefore not only to defy tradition as regards long clothes, but to make use of tight woven materials rather than of woollen garments.

The three great essentials of hygienic clothing are that they should be non-constricting, porous, and light and warm. Cotton materials are useless, merely impeding a free circulation of air, and giving extra work

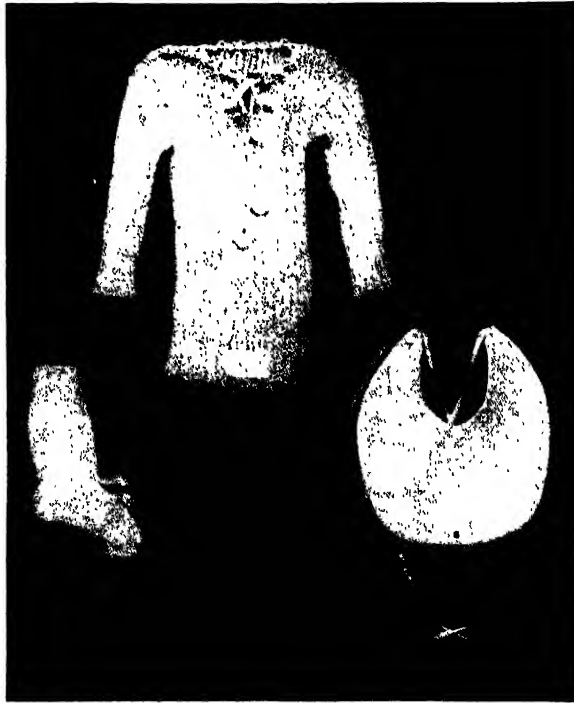
to the mother or nurse in the way of starching or ironing. Cotton or thick close-woven materials give weight without warmth.

Long clothes should never be used. Baby cannot use his limbs and kick as nature would have him do if he is hampered by the weight of yards of material, or packed up like a parcel in a flannel wrapper. He is not a model for the mother's skill in embroidery, but a living helpless being dependent on her for his future health.

Patterns of the baby clothes here described can be obtained from the Mothercraft Training Society, Highgate. They are planned to fulfil the conditions enumerated above and at the same time are economical. The poor mother will find that the petticoats and frocks last the whole of the first year and the nightgown even longer. To the

inexperienced eye they may appear large at first, but this is partly due to the Magyar shape. When drawn in by the bit-tapes tied loosely round the waist, they have not even the appearance of size, and they obviate the necessity of making two sets of baby clothes.

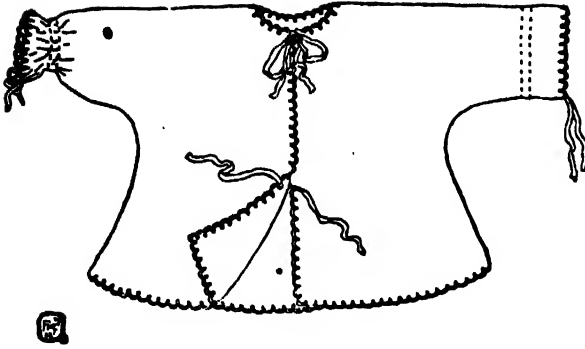
Below is a list of the minimum number of clothes with which each baby should start life, and this number should be in readiness by the end of the seventh month :—



THREE ESSENTIAL GARMENTS

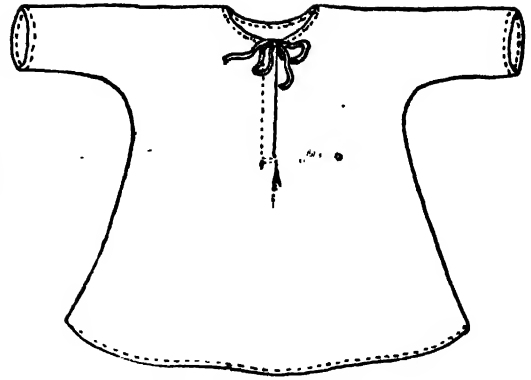
The vest is of silk and wool mixture, the booties are of pure wool, and the bib of double pique.

MOTHER AND CHILD



A SMALL COATEE

The coatee is intended to protect the chest and arms in cold weather.



THE FIRST SHIRT

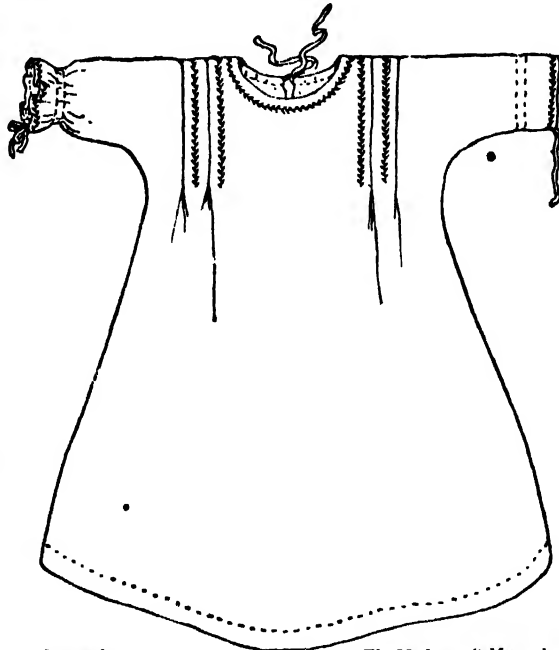
A shirt of cellular material should be worn under an all-wool vest.

- | | |
|---|-----------------|
| 4 Long-Sleeved Vests | 3 Pairs Bootees |
| 3 Petticoats | 1 Large Shawl |
| 3 Frocks | 2 Small Shawls |
| 3 Nightgowns | 6 Bibs |
| 3 Knitted or Woven Coatees | |
| 4 Doz. Turkish Towelling Napkins or 2 Doz. Turkish Towelling Napkins and 2 Doz. Soft Napkins. | |
| 6 Handkerchiefs. | |
| 1 Crêpe Bandage, 3½ in. to 4 in. wide. | |

Vests should be made of a silk and wool mixture, preferably one in which the silk and wool is interwoven and not merely twisted together. This mixture does not shrink, besides being so soft that the vests can be made on the large side and will fit until the baby is about nine months old. Silk merino at 2s. an ounce can be used, or there is a cheaper mixture called Silkora. Ribbed knitting fits more closely than

plain, and the vests should be high-necked and long-sleeved.

The movement needed to slip the vest over the head is no drawback to the pull-on vest. The layers of clothing should be evenly distributed over the body. Cross-overs only double the thickness on the chest and they are apt to pull down, thus leaving exposed the very part which should be protected. The vest should be pinned down to the napkin to avoid a gap, and if two inches of tape is sewn to the bottom of the vest, the safety-pin will not damage it.



[Courtesy]

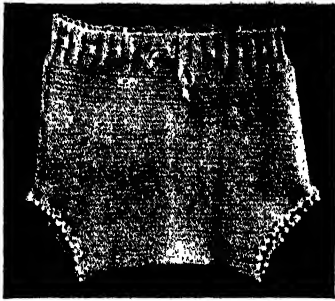
[The Mothercraft Manual]

A SIMPLE FROCK

Silk and woollen material can be used for this frock, which is 24 in. in length. The nightgown is made in the same way, but without the tucks on the shoulder.

If, as often happens, the mother is given all-wool vests for her baby, she can always make little aertex or butter muslin shirts to wear under them. Many adults cannot stand the feeling of wool next the skin, and yet it does not occur to them that some babies may suffer in the same way and that their crying may be stopped by a change of vest.

THE GOLDEN HEALTH LIBRARY



KNITTED DRAWERS

Many modern babies wear knitted suits from birth instead of petticoats.

This is for use to keep the dressing in place until the umbilical cord is healed. One bandage should be cut into three lengths and should be amply sufficient. The crêpe is so fine that the warmth of it will not be missed when it is removed. Binders, which are tight enough to stay in place, restrict the abdominal organs and impede respiration.

These can be bought ready-made, or the Turkish towelling can be bought by the yard.

They should not be more than Napkins. 23 in. square and should have the edges blanket-stitched. A hem is liable to be clumsy and to make an uncomfortable ridge. These napkins can be supplemented by some of soft butter muslin, which are ideal for small babies, and almost essential if the baby ever has sore buttocks. They can be home-made of three thicknesses of butter muslin, but it is really better to get the Harrington absorbent napkins. These wash very easily and wear well. It is a good plan to fold a Turkish towelling napkin in half and lay it round the baby over the softer one. This often saves changing of petticoat or frock.

Light-weight flannel or viyella is the most suitable material. Ribbon shoulder straps are useless, as they leave uncovered the apex of the lungs—a very vulnerable part. Choose a coarse quality of material as the finer qualities lose their cellular character after washing. It should be 23 in. long to reach well below the feet while the baby is

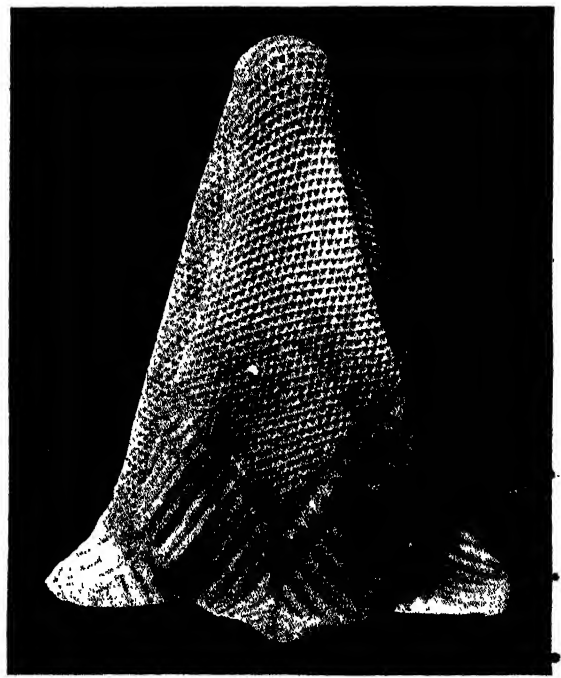
tiny. Strings round the waist only impede the breathing.

This, like the coatee, is of Magyar pattern and should be made in a fine woven material, such as crêpe flannel, delaine, Frock. nun's veiling, cashmere, or wincey.

Cotton crêpe, artificial silk, or aertex for summer wear is advisable, and some mothers prefer the knitted frocks. A narrow binding should be sewn on the inside of each sleeve about 1 in. from the base, so that a ribbon can be run in and the sleeve gathered together. It is a good plan to tie the bow on the inside, otherwise the baby fingers soon pull it apart. Frocks should be 24 in. long to cover the petticoat.

This is made on much the same pattern as the frock, but it is wisest to leave these until the rest of the layette is complete.

Coatee. A first baby is usually well stocked with knitted coatees by friends and relations, and provided the petticoat and frock are sufficiently warm they should certainly be used.



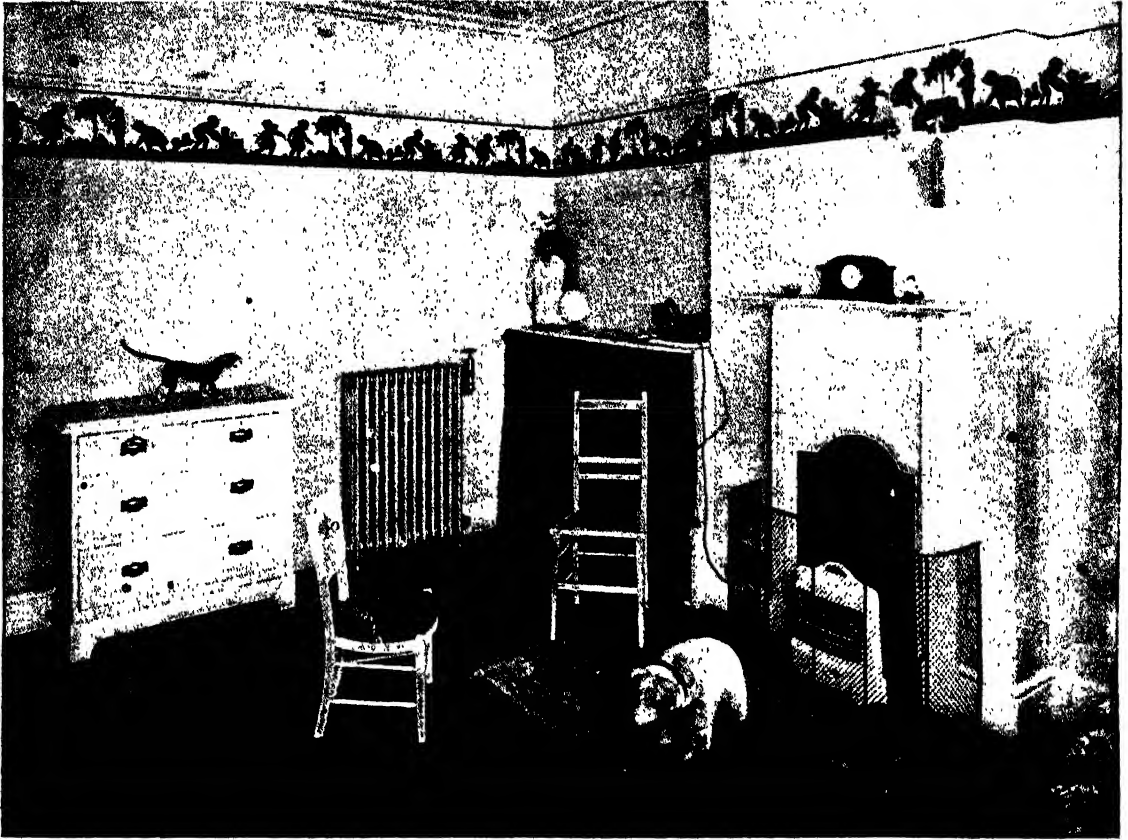
Courtesy

BABY'S SHAWL

[Treasure Col Co.]

A large shawl is needed for outdoor wear, and a small one for indoors.

MOTHER AND CHILD



A CORNER IN AN IDEAL NURSERY

The nursery must be light and airy, and should have washable walls, uncarpeted floor, and, if possible, a gas fire.

This should be made of the same material as the petticoat, either flannel, wincey, or viyella. For summer wear crêpe flannel can be used. Cotton nightgowns are useless.

Double thickness of piqué or linen or a single piece of towelling can be used. Bibs are best made at home, as shop-bought bibs seldom fit well round the neck. Tapes should be sewn on either side at the bottom of the bib, and these are tied loosely round the baby, so obviating the use of the dangerous safety-pin.

These are essential except in very warm weather. They should be made long enough to reach the knees. The importance of keeping the extremities warm cannot be sufficiently emphasised.

Only a premature baby needs a head-

covering indoors, and when out-of-doors a healthy baby is better wrapped in a large shawl than wearing a bonnet, except in very cold high winds.

Indoors he can be wrapped in one of the small shawls kept for the purpose. Veils are a relic of bygone days when a breath of fresh air was considered fatal, and should never on any account be used; they merely collect the dust. Baby's nose is sufficient filter for fresh air, and his face is easily washed.

For outdoor wear a knitted pilch is useful, but mackintosh knickers should never be used except for very short periods of time. Being non-porous they

exclude the air, keep in the secretions of the skin, and finally form a kind of unhealthy poultice which rapidly causes sore buttocks and resulting ill health. For long journeys sphagnum moss is exceedingly

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BASKET COT AND STAND

A wicker cot is quite inexpensive and allows fresh air to reach the baby.

useful. It absorbs the urine, rendering it non-offensive, and can be thrown away after use, thus disposing of the difficulty of carrying the wet napkins home.

THE NURSERY

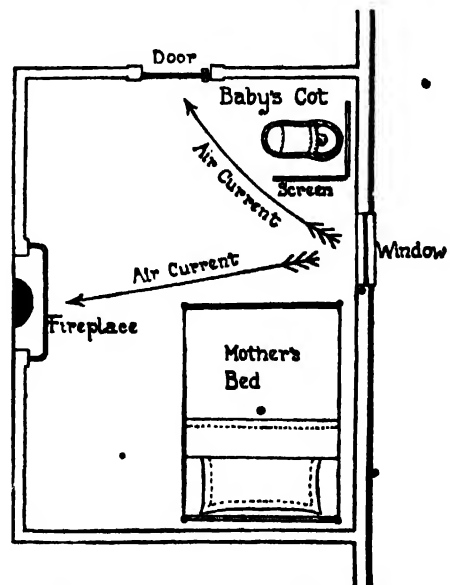
One of the first thoughts in the mother's mind after planning her layette is as to which room she will choose for the nursery. In a large house this is usually a simple matter, as two rooms can be set aside for the baby, and sometimes even a third as the nurse's bedroom. A dressing-room, if properly ventilated, can often be adapted as a night nursery containing practically nothing but the cot. In a small house the difficulty is very much greater, but an effort should be made to give baby a bedroom to himself as soon as the regular routine is established and he sleeps his seven or eight hours at night. He must, of course, be well within earshot at all times. If he has to sleep in the mother's room, he should not be in that most favourite spot, by the side of her bed, away from the window and all fresh air. The diagram on this page gives a clear idea of a room in which the baby has his own supply of fresh air without a draught.

The room chosen for a nursery, supposing only one to be available, should face south,

if possible, certainly never north. It should be well ventilated, light, and airy. A window alone is not sufficient ventilation.

Heating and Ventilation. If there is no open fireplace, cross ventilation should be arranged into the passage outside by means of a ventilator in the dividing wall. Even with an open fireplace it is a good plan to have a small ventilator fixed high above the mantelpiece into the chimney. The draught from the fire will draw away the hot air which naturally collects at the top of the room, and this will be replaced by the fresh air from the ever-open window.

The ideal is to have a balcony on which baby's cot can stand at all times, only being brought in for necessary purposes. It must be remembered in this case that to put a baby outside in a pram with the hood up is useless. He is far better off in front of an open window in his cot. The hood holds up all the inspired air and prevents the fresh air from reaching the child. Babies are far hardier than is generally supposed, and it is a well-established fact that the colds and bronchitis, once considered inseparable from the nursery in winter-time, were largely due to overheated and insufficiently ventilated



Courtesy]

[The Mothercraft Manual

THE NIGHT NURSERY

The diagram shows a good position for the cot and the mother's bed.

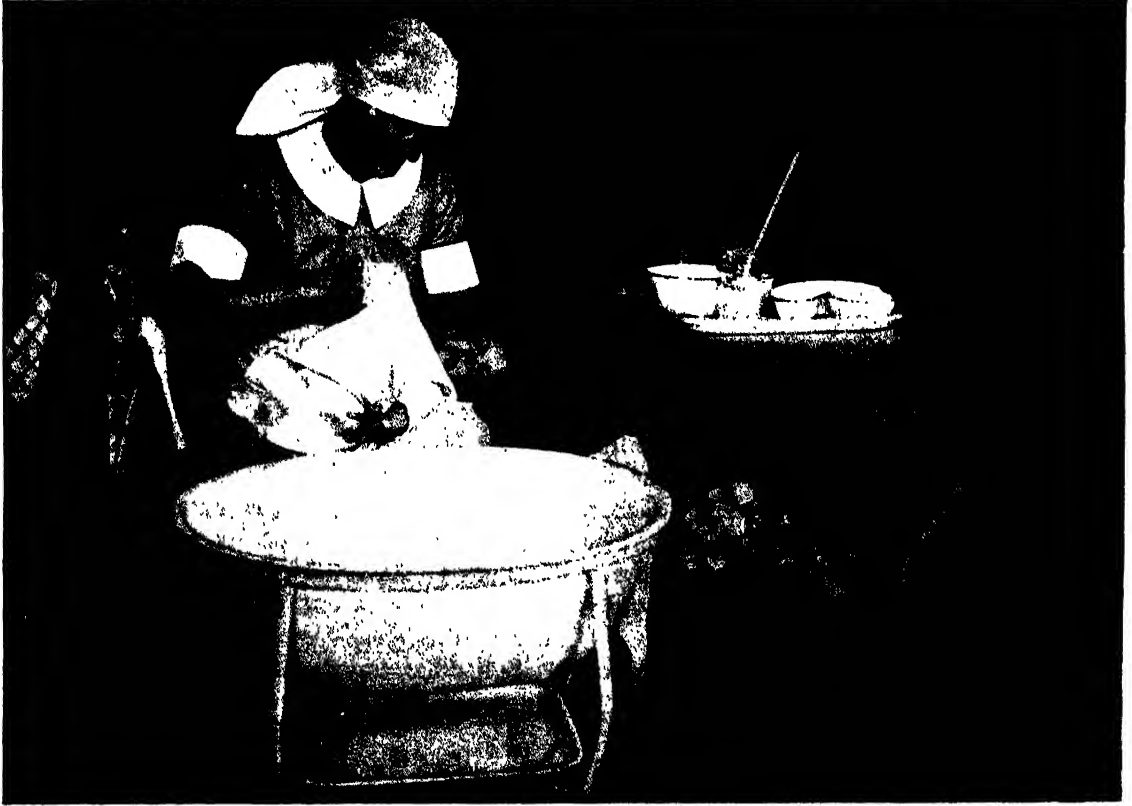
MOTHER AND CHILD

nurseries. Continuous heating even in the depths of winter is totally unnecessary, but the room must be warmed for bathtime or whenever exposing baby, or for the mother's sake in cold weather at feeding times.

At the headquarters in London of the Mothercraft Training Society, all healthy babies sleep in the open air on a well protected balcony night and day, and their

stove. A high fire-guard will be necessary later on, though it is not essential during the early months. A rail outside for the final warming of baby's clothes is convenient, and the guard should be wide and long enough to protect the gas tap or electric switch from mischievous small fingers. A ring for a saucepan or kettle is useful if the kitchen is not close at hand.

The nursery walls should be covered with



BABY'S TOILET

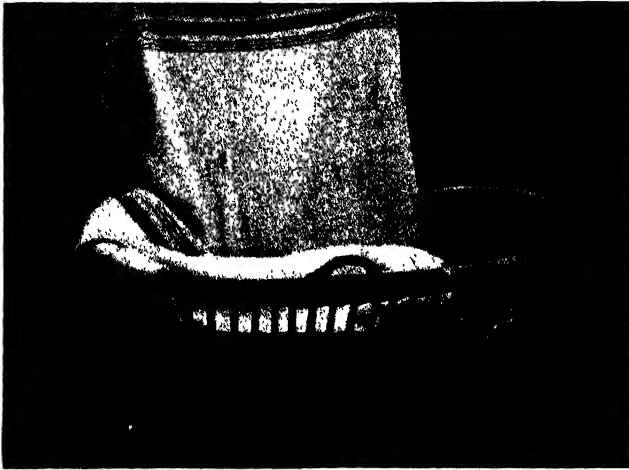
The bath should be fairly deep, and an enamelled one is the most serviceable. Soft towels are essential, and small bowls for boiled water and cotton wool swabs.

sturdy healthy bodies and freedom from coughs and colds, testify to the excellent results of this treatment.

A gas or electric fire is the most practical for a nursery, as it need only be lighted when required. A bowl of hot water in front or on top of the gas stove will prevent undue drying of the atmosphere, but care should be taken to ensure that there is adequate provision for the escape of products of combustion, as in the modern types of gas

light washable paint or distemper, or a cheerful washable paper. The lower 2 to 3 feet can be panelled if preferred. Framed pictures are best avoided altogether. They collect dust on frames or cords, and, for the first two years of life at least, a picture conveys little to the childish mind. A low dado of large, coloured animals is far more attractive, and later on a few good pictures can be introduced. Of all rooms in the house, the

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MAKING THE COT (I.)

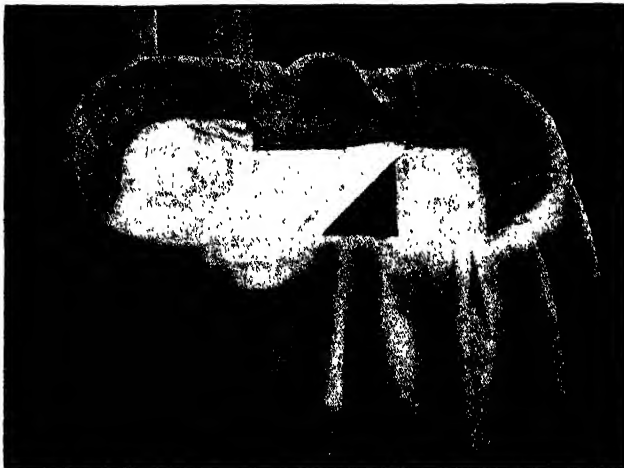
A soft blanket is placed lengthwise across the cot under both flock and chaff mattresses.

nursery is the one where cheap art should be avoided.

Carpets are, of course, out of the question, something more hard-wearing and easier to keep clean is essential. Cork

Floor. lino or induroleum is by far the best as, though the original outlay is expensive, such a covering will last for many years. It is easily washed or polished and is quite warm to the feet. It should be fitted close up to the walls and into every corner so that the dust will not collect under the edges.

The nursery should be conveniently placed



MAKING THE COT (II.)

When finished, the cot is transformed into a cosy sleeping bag with a low pillow.

as regards the bathroom and lavatory. If the cost is not prohibitive it is a good plan to have a fixed Bath. basin in the nursery with

hot and cold water taps, not forgetting the draw-off taps underneath from which to fill the cans for baby's bath. The outflow pipe must be properly syphon-trapped.

Baby's bath should be of a fair depth for use up to eighteen months at least, as it is difficult to bath an active infant at the bottom of an adult-sized bath, and a shallow basin deprives him of the pleasure and exercise of splashing.

Papier-mâché baths can be obtained, but for those who can afford

it an enamel bath is far easier to clean and more likely to last. The very poor mother can quite well use a wooden wash-tub, but it is a little difficult to keep these free from splintering. An old blanket or sheet should be used as a lining. The bath should always be used on a stand. These can be bought with the enamel baths, or a handy father can often make a wooden one. Two chairs can be put together as a makeshift, but, in any case, baby should never be bathed on the floor, always a very draughty spot.

Soft face towels are needed, and these will be found an expensive item if

Towels, the mother wishes to have
etc. linen ones, though they
will last indefinitely. Three

layers of butter muslin stitched together are just as effective. Soft bath towels are essential, and at least two of these and three face towels will be required. A sponge should not be used, owing to the difficulty of keeping it scrupulously clean and the impossibility of boiling it and so freeing it from germs. Face cloths of butter muslin about 8 in. square, and buttock cloths of Turkish towelling or sponge cloth, are better than any kind of sponge. They should be hung on separate hooks and should be washed

MOTHER AND CHILD

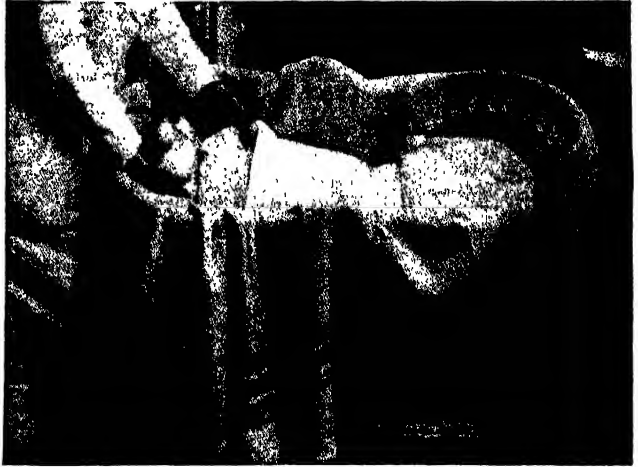
and boiled once a week. Soap should be of the purest, such as superfatted Castile.

The modern baby requires very little in his basket, but it is a convenience if it has a lower shelf on which to put his clothes as they are discarded at bathtime. The basket should contain needles, white cotton, crêpe bandage (for use until the cord is healed), large safety-pins for the napkin, hair-brush and comb, and a pair of scissors with rounded points. The upper shelf of the basket can be lined, and pockets made to hold the various articles. A cover to match the screen and cot coverlet gives the finishing touch and protects from dust.

The dainty touches which each mother loves to give her nursery must and should vary according to her individual taste.

Other Nursery Accessories. Apart from cot and screen, which are dealt with later, there are a few other nursery necessities. These include two enamel pails, with air-tight lids, to hold wet and soiled napkins, a bath thermometer and small enamel or china chamber, preferably also with lid; also a steady four-legged table, unpolished, and a small cupboard well out of reach of the small child, in which to keep the medicines, ointments, etc., which gradually collect in every nursery. It should be stocked with vaseline, cold cream, powder for the cord (the midwife or doctor will advise as to this, usually a mixture of starch, zinc oxide, and boracic powder), a screw-top jar containing cotton-wool swabs, and one or two small bowls, also a receiver in which to put the swabs after use. This should be easily cleaned, and when in use must be boiled at least once a day.

A low chair, without arms, for mother and nurse should be provided, and later on a small chair and kicking-pen for the toddler. The latter is useful quite early as a safer

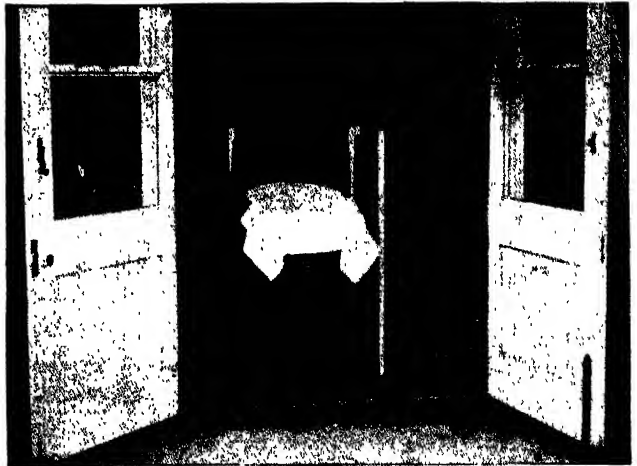


MAKING THE COT (III.)

If a hot-water bottle is necessary it must be inserted between the two mattresses.

exercising place for baby during the half-hour before a feed time. It must be carefully secluded from draughts and provided with a mattress to fit, covered with mackintosh and blanket. The mattress can be quite well filled with chaff on the same principle as the chaff shakedown on the cot.

Finally we come to the cot, really the most important article of nursery furniture, as in it baby will spend at least nine months of his first year. For this reason special attention must be paid to the free circulation of air all round it. Gone are the hangings beloved of our



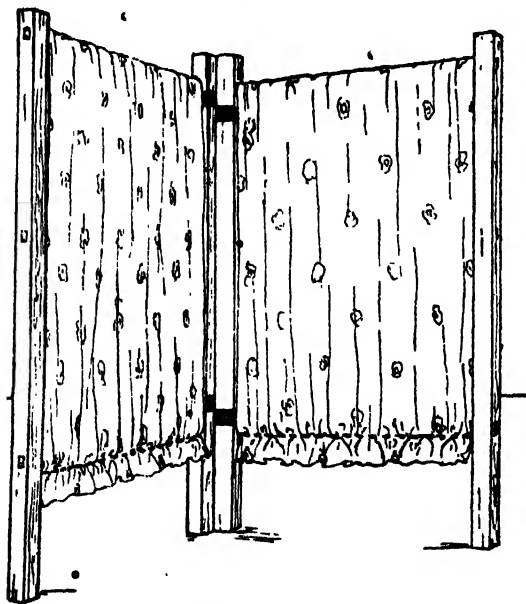
THE COT IN POSITION

A baby requires plenty of fresh air, but should always be protected from draughts.

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grandmothers—harbouring the dust and keeping baby's stagnant breath hanging heavily above him. An open wickerwork cot is preferable to any other kind. It is light, easily washed and dusted, and allows a constant stream of fresh air to surround the child. Prices vary from 15s. 6d. upwards, complete with stand, and they can be painted to suit the colour scheme of the nursery. The wise mother will not surround the cot with layers of muslin and silk, so doing away with all the advantages of the wicker cot. She need never fear fresh air of whatever temperature, and draughts can be excluded by the use of a little twofold screen about four feet high. Sir F. Truby King in *Feeding and Care* shows this most clearly in an excellent illustration demonstrating the evil effects of a lined or canopied cradle in confining baby's stagnant and poisoned breath to the space immediately about him. "Only excessive, direct rapid draughts of cold air are harmful."

The little screen can be kept as fresh and dainty as possible, and can be economically made from a small clothes-horse, painted, but care must be taken that it is properly hinged or a draught will be caused.



A SIMPLE SCREEN
A towel-horse and some lengths of cretonne
make a charming screen.

The method of making the cot is best explained by the accompanying illustrations, and the cot should be made in the same way even in the poorest homes, where perhaps a clothes-basket or half a pilgrim-basket has to take the place of the more expensive kind.

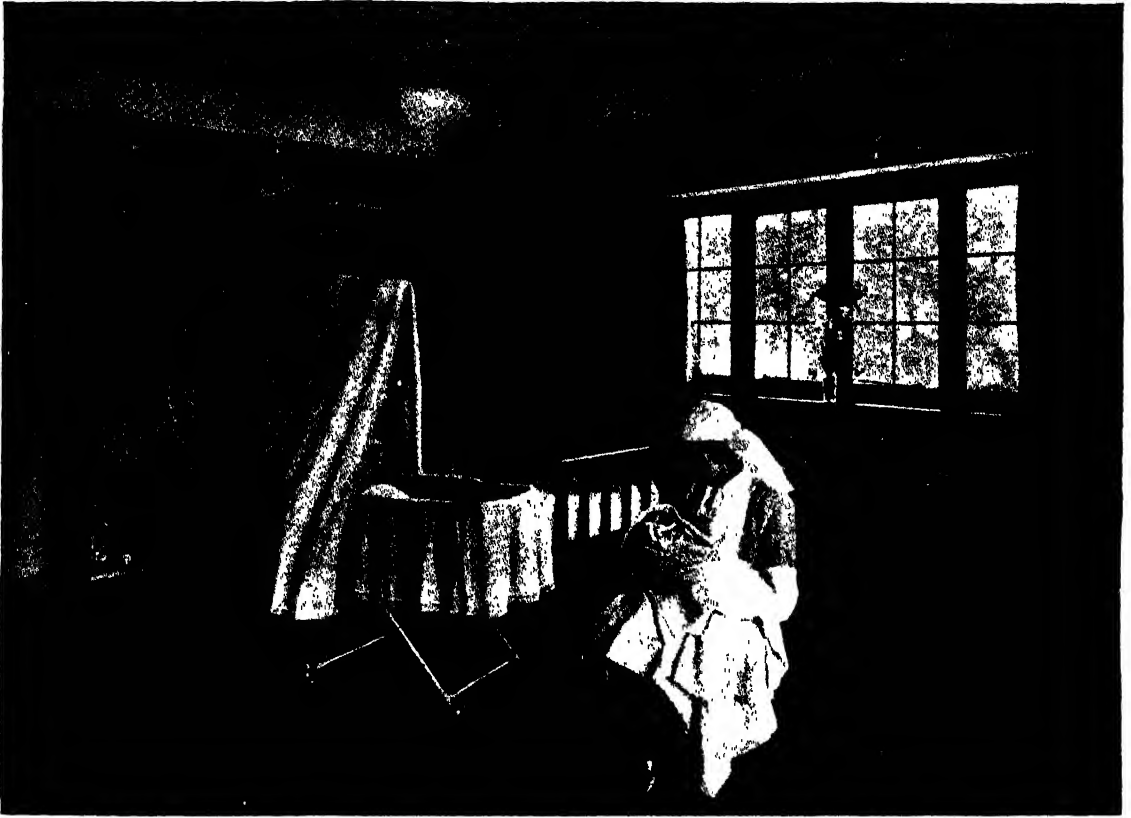
A coarse *net lining* should be made for the head of the cot, as it is only to break the direct current of air and to ensure an even circulation. It should reach far enough down to avoid a gap between it and the *enveloping blanket*. The blanket should be placed lengthways across the cot, leaving one side longer than the other. A flock or *hair mattress* placed on this makes a firm foundation, and should be provided with a loose washable cover.

Over this a *chaff mattress* is placed. The advantages of this are manifold. It is light, warm, and soft, can be easily changed, the chaff baked if soiled, and it is extremely inexpensive. It does away with the necessity of the unhealthy, long mackintosh.

Over the chaff mattress comes a small soft *under-blanket*, just long enough to tuck under the chaff mattress at top and bottom. Across the centre of this, lay a strip of *rubber sheeting*, 21 in. by 12 in., and over this a slightly larger piece of flannel *vivella* or non-inflammable flannelette.

A small low *pillow of chaff* rounded to fit the head of the cot is all that baby needs. For the first few months of his life an infant should be kept as flat as possible while resting. A slight hollow should be made in the centre of the cot for baby to lie in, and a *small soft blanket* or shawl should be loosely arranged over him. The sides of the blanket are now brought up and tucked into the opposite side of the cot, taking the shorter side first. The ends are tucked under the mattress or brought up in a single fold over the feet. Tuck the shawl up warmly round the baby's neck, but leave plenty of room for him to move his body, and leave his nose and mouth free to breathe. If a *hot water bottle* is necessary it must not be hotter than 180° F.

MOTHER AND CHILD



NATURAL FEEDING OF THE INFANT

By REGINALD C. JEWESBURY, M.A., M.D., B.Ch., F.R.C.P., Physician-in-Charge of the Children's Department, St. Thomas's Hospital; Medical Director, The Mothercraft Training Society.

I THINK it may be said that breast feeding is gradually becoming more common in this country with mothers of all classes—this is because these mothers are receiving better instruction with regard to the management of their babies, *i.e.*, the teaching of "Mothercraft" is beginning to bear fruit. But although many mothers start with firm intention and willingness to breast feed, how often it happens that this is only done for a short time and the baby is prematurely weaned, very often to the great regret of the mother. The story usually told is that "the milk went," or that "it did not agree with the baby."

Now it must be fully realised that there is a definite technique with regard to breast feeding; there is a right way and a wrong,

and unless the right way is practised failure is likely to result. The failures then, which are unfortunately still far too frequent, could nearly all be prevented if the mother is properly guided over her difficulties by one who has gained the special experience which is necessary in these cases.

I think it is hardly necessary to stress the value of breast milk in preference to any other kind of food for the infant. It must, by now, be fully realised that Nature has designed a particular form of nourishment which cannot possibly be adequately replaced by any substitute. Many substitutes which are made use of are utterly unsuitable and very harmful, and even though they may appear to agree at the time, sooner or later definite signs of ill health or mal-development will arise. At

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[Topical

"WEIGHING-IN"

Sir Arthur Newsholme, K.C.B., F.R.C.P., an eminent advocate of a preventive health policy, is seen testing babies' weights in New York.

the best we must be content with a suitably modified cow's milk.

With the advent of "Certified Milk" a great advance has been made by the dairies, and for those who are able to afford it, a reasonably good quality of clean milk is now obtainable; but even the best cow's milk cannot really be "humanised," since the composition of cow's milk differs not only quantitatively, but also chemically from human milk. Poorer grades of cow's milk have still more obvious disadvantages. The milk of every mammal is specially designed by Nature to meet the requirements of the young of its own particular species, and these different milks are not interchangeable. One of the main disadvantages in the use of cow's milk is its protein—this is in greater amount than is present in breast milk, and it is of a much more indigestible nature, leading to the formation of tougher curds in the baby's stomach than does human milk. Any milk mixture containing an excess of protein of this kind must be harmful to the infant, and even when cow's milk is so modified as to reduce the protein to a suit-

able quantity, it is still unsuitable in quality. The fat also in cow's milk differs from that of human milk, the globules are less finely emulsified and therefore harder to digest.

Statistics prove that the mortality of breast-fed babies is far less than that of bottle-fed; breast milk provides the infant with an immunity to, or protection from, infections of which the bottle-fed child is deprived.

To certain types of delicate babies breast milk is absolutely essential, and they will perish unless they get it—in these cases if it cannot be provided by the mother, it must be obtained from a foster-mother.

Now, if breast feeding is of such vital importance, how is it to be successfully accomplished? It is all a question of teaching the mother the correct method of nursing her baby.

In the case of the poor class mother, she should be prepared for this at an ante-natal clinic, by explaining to her how important breast milk is for her expected baby, and that it will save her time, labour, and money. Her breasts should be examined,

To Ensure
Breast
Feeding.

MOTHER AND CHILD

and any deformities such as retracted nipples dealt with ; attention should be paid to her general hygiene and diet.

After the arrival of the baby, it is the duty of the midwife to see that it is properly started on the breast, and as soon as possible the mother should attend an infant welfare centre where she continues to get advice at regular intervals, and where any difficulties are dealt with.

In the case of the mother who can afford to choose, she is wise if she engages the services of a doctor for her confinement who is a believer in breast feeding, and perhaps what is even more important is to make quite certain that her maternity nurse has had special training in this all-important subject. Unless the baby is properly started on the breast at the beginning it is often very difficult to get lactation established later.

In ordinary straightforward cases where five feeds are given at four-hourly intervals, breast feeding should not be a hardship or too much of a tie to any woman. She may lead quite an ordinary life and take an ordinary diet, but it is essential that she

should get a sufficient amount of rest, be freed from worries, and take rather an excessive amount of fluid (water).

One of the commonest mistakes is over-feeding the baby ; this causes vomiting, frequent green relaxed stools and fretfulness, and if it is thought that the milk is disagreeing with the baby, the amount taken in the twenty-four hours should be checked by test feeds for which a reliable weight scales is necessary. Such scales can be purchased for about £4, 4s., or can often be hired from a large chemist or scale-maker. Test feeds are always necessary in any difficult case of breast feeding. If it is proved in this way that the baby is getting too much, the times at the breast must be reduced accordingly.

If the baby is underfed, it is usually constipated and fails to make sufficient weight.—in this case the main endeavour should be to increase the amount of breast milk. The most important stimulus for the breast is to make sure that it is completely emptied at each feed by the baby. In these cases it may be necessary, temporarily, to give



[Courtesy]

[Sudan Government]

HEALTHY NATURE BABIES

These African children have grown strong and healthy on a natural diet and an unlimited supply of sunlight.

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complementary feeds if the deficiency of breast milk is large, and the proper adjustment of these feeds is most important.

The complementary feed is given after the baby has been to the breast. Partial breast-feeding is far better than no breast feeding at all.

Re-establishment of lactation, *i.e.* getting the baby back to the breast after an interval of artificial feeding, can, in many cases, be successfully accomplished, but this depends on special circumstances which can only be determined by those who have the necessary experience.

Two factors are essential if the breast

Essentials for Breast Milk. milk is to be got back again — (a) the mother

must be keen and willing to nurse her baby, and (b) the baby must be made to suck at the regular feeding times and so provide the most important stimulus for the failing breast. Provided these two factors can be relied on, other measures, such as alternate hot and cold sponging the breasts followed by massage, hand expression of any milk left by the baby, and the drinking of extra fluid by the mother, all have their value.

Complementary feeds will, of course, be necessary until the breast milk is sufficiently restored.

It has been found possible to get the baby back to the breast in some cases even after an interval of nine weeks of complete artificial feeding. In one remarkable case I know of the baby was never put to the breast at all until it was ten weeks old, and yet it was found possible to stimulate the secretion of milk, and after a period of six weeks to get the child entirely breast-fed.

With the better education of the mother and wider facilities for the study of this subject by doctors and nurses, at least three-quarters of the infants in this country could be fully breast-fed, and 90 per cent. of them could be partially so fed.

ADVANTAGES OF NATURAL FEEDING

By MABEL LIDDIARD,
Matron, Mothercraft Training Society.

THERE are three things essential for a baby's

welfare — right food, fresh air, and sleep, the last depending largely on the adequate supply of the first two. As regards the first requirement there can be no two opinions. Breast milk is the inalienable right of every baby, and it is impossible to over-estimate the value of natural feeding. No artificial food can ever be more than an imitation, an emergency substitute for the living vital fluid which is prepared from the mother's blood stream and succeeds naturally to the nourishment



A PICTURE OF HEALTH

This well-developed baby boy is nine months old.

given before birth. Statistics show clearly that breast-fed babies have a far greater expectation of life than artificially reared infants, 85 per cent. of those infants dying under one year in Great Britain being bottle-fed. Summer diarrhoea is rare among breast-fed babies, and one of the greatest protections against early rickets is the breast milk of a healthy mother.

Breast milk is more easily digested than any other food owing to the soft protein curd and finely divided fat globules. Thousands of babies owe their lives to the generous help of a foster-mother, when all else has failed. The temperature of breast milk is always

MOTHER AND CHILD



FEEDING TIME

The mother will be most comfortable on a low chair in a quiet warm corner ; a clock and her tray of etceteras must be near at hand.

right, and it is free from pathogenic organisms. It contains certain antibodies conferring immunity on the baby, which accounts for the otherwise perplexing fact that the breast-fed baby whose mother has scarlet fever is rarely infected from her. The actual effort of sucking helps to form a well-shaped jaw with space for the teeth, and increases the flow of saliva, thus keeping the mouth healthy and clean. The bottle-fed baby does not obtain the same benefit by the lip-sucking of his teat.

The advantages to the mother are many. Her health should not suffer from breast feeding, in fact many delicate women have grown stronger and more robust owing to the regular hours for meals and rest necessary for a nursing mother. A quicker recovery from the confinement is noted in those cases in which

the mother breast feeds, the blood stream being naturally directed from the inactive uterus to the active mammary glands. Where the milk has to be dried away, the uterus is slow to involute, and return to normal is delayed.

The mother who breast feeds has an easy task—no bottles to wash and boil—no food to prepare with anxiety lest she should not be giving exactly the right thing—none of the ghastly anxiety confronting the poor mother whose money is running short. She knows that her baby is having the one food best

fitted to lay a sure foundation for health and welfare, to build a sturdy frame and firm straight limbs, and she is satisfied that no expense on her part would produce anything more perfect than this naturally provided food.

There are four types of women who are



MOTHER'S REST HOUR

A very busy mother may find it most convenient to take her rest at feeding time. On no account should she do without it altogether.

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failures in breast feeding. The first are those who never attempt it, either through ignorance or laziness : these grow fewer year by year ; the second, those whose milk is naturally deficient in quantity and quality. The third are the most numerous—those who attempt it and give up too soon, usually on wrong advice. The fourth is a very small, almost negligible class—those who are not allowed to breast feed owing to some definite illness such as acute tuberculosis or some such progressive wasting disease. It is interesting to note that in these cases the glands of the breasts secrete milk. It is not, therefore, that the mother *cannot* breast feed, but that it is unwise for her to do so.

A nursing mother is not an invalid, and there is no need for her to deny herself such healthy exercise as riding, tennis, etc. Her chief care during the nine months while she is feeding her baby will be to live a natural life following her ordinary occupations as far as possible. Over-fatigue must be avoided, and bathing and swimming are best postponed until three months after the confinement to ensure that a complete recovery has been made before risking any infection.

It is essential for her to obtain sufficient rest, as her day is very long, and a midday rest must be arranged of an hour's duration if possible. Where there are several children and this is difficult to manage, the mother can give the feeds while lying down.

There is no reason why she should not take the ordinary food of the household, avoiding in excess anything which is highly flavoured, such as pickles or curries. Some fruits such as strawberries, gooseberries, or rhubarb must be taken for the first time with caution as they are apt to cause acidity. Green vegetables of all kinds, including the much abused cabbage, should be taken in order to provide the vitamins and necessary calcium salts. An extra pint of milk a day is a useful addition to the diet, but must not be allowed to replace other more valuable foods. The old-fashioned plan of plying the

nursing mother with food at frequent intervals resulted in upsetting first her digestion and then her supply of breast milk, and the old adage that "milk makes milk" is responsible for many difficulties. Alcohol should be completely avoided, and stout, the famous standby of the Sarah Gamp period, is completely useless as a "milk maker." The various milk-stimulating preparations on the market are chiefly valuable for their psychological effect, except in the case of the underfed or poorly nourished mother, when they supply a need which could be met less expensively. Extra water is a necessity in order to replace the fluid taken by the baby. At least $2\frac{1}{2}$ pints of extra water a day should be taken by the nursing mother. This is most easily remembered if a glass of water, either hot or cold as desired, is taken at each feed time, the ordinary amount of fluid being taken at meal times. The extra water has a wonderful effect in ensuring the supply of milk.

Constipation must be avoided, as this has a very definite effect on the baby. It is best overcome by natural means, such as the extra water, and food containing a large proportion of roughage, such as vegetables. Apples, figs, prunes, and dates are all helpful. Plenty of exercise should be taken, and the exercises advised for use during the ante-natal period may be continued with benefit. The whole muscular system may be toned up by a tepid or cold sponge after the morning bath. Constipation often vanishes when the general health receives attention. Strong aperients should never be taken, but rather those which have a tonic effect on the intestinal muscles and the use of which can be gradually discontinued. Best amongst these are preparations of cascara and of paraffin, taken in small doses two or three times a day.

The management of the feeding during the first week of lactation is an extremely important point, often proving the decisive factor for or against success. Many babies are weaned unnecessarily during the first fortnight on the supposition that the milk is

The
First
Week.

MOTHER AND CHILD



HAPPY MOTHERHOOD

Mabel Robey

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not coming in. It should be clearly understood by nurses and mothers alike that lactation is often not fully established until the third week, and that breast feeding should never be despaired of under a month, when partial breast feeding should always be considered possible.

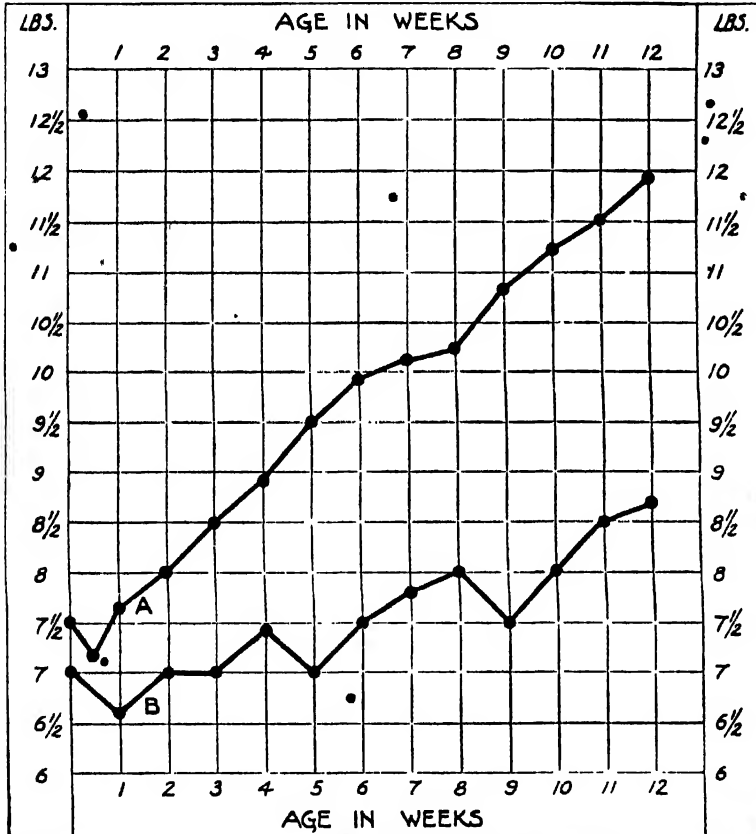
Apart from the importance of starting in

	Sugar.	Fat.	Protein.
Colostrum to 8th day	3.0	2.5	6.0
Colostrum at end of 1st week	6.0	3.0	3.0
Breast Milk at end of 1st month	7.0	3.5	1.5

It is even more impossible to make an artificial food resembling colostrum than

to make one which resembles breast milk, and it is therefore easy to realise that even a week's breast feeding is better than none.

For the first few days the baby needs and obtains only a few teaspoonfuls of fluid from the breasts, but he must be put to them at regular intervals in order to assist the proper functioning of the glands and to teach the baby to suck. The first feed should always be given within twelve hours of birth, preferably as soon as the mother is rested. The baby should be put to both breasts, but for not more than two minutes each side. After this the feeds should be at regular intervals, six-hourly the first day, four-hourly the second, and three- or four-hourly according to circumstances on the third,



Courtesy]

["Our Baby" (1914 edition), by Mrs. J. Langton Hewer]

WHAT BABY'S WEIGHT SHOULD BE

The upper curve shows the weight of a child properly fed, and the lower of a child improperly fed.

the right way, it must be remembered that the colostrum which precedes the breast milk is of the utmost importance to the baby. It is not an aperient merely to remove the meconium, as was once taught, but contains valuable antibodies, and has a very high food value, the proportions of fat, sugar, and protein gradually changing to those of breast milk as will be easily understood by the following table :—

increasing the time gradually up to ten minutes for each breast, which is the average time needed by a normal baby.

If during the early days the baby is restless or thirsty, a few teaspoonfuls of warm boiled water will soothe him. Complementary artificial food should be avoided as long as possible, even at the risk of more than the usual loss of weight during the first week. Once a bottle feed is begun the

MOTHER AND CHILD

baby loses the hunger which is his great incentive to hard sucking, and the glands lack the necessary stimulation to make milk. When breast feeding is fully established he will make up for his slow start much more quickly if his digestion has not been upset by a strange food.

Remember always that it is the regular

stimulation of the mammary glands by the sucking that increases their power to function, and that complete emptying of the breasts is essential if it is desired to increase the flow of milk. On the other hand, the baby must not be allowed to suck at the breast until he chooses to let go or falls asleep with the nipple still in his mouth. Sucking at an empty breast overstimulates it, and will diminish, not increase, the supply. The continual dragging on the nipple renders

it sodden and more likely to crack. Feeding should be carefully timed, and most babies will completely empty the breasts in twenty minutes, ten minutes on each breast. When feeding four-hourly, both breasts should always be given at each feed, as eight hours is too long for one to go unstimulated, apart from the discomfort to the mother. In three-hourly feeding, when the mother has a good supply, alternate breasts may be

used, but if the milk decreases both should be given, so that they may have equal stimulation. It is a sad mistake to bottle and breast feed alternately in the hope of "saving up" the milk.

The final decision as to hours of feeding must depend upon the doctor or nurse in charge of the case, but as a general rule

it can be taken for granted that a healthy baby

over
Hours of 7 lb.
Feeding. c a n

be fed four-hourly from birth, and that a baby does not need a night feed unless under 5 lb. Some babies under 7 lb. do well on the four-hourly system, but unless an experienced nurse is in charge it is better to begin in this case with three-hourly intervals, changing to four-hourly as soon as the baby is making good progress.

If the night feed is necessary, it should be

given punctually at the same hour each night, and should be stopped as soon as the baby is making steady progress and before the change to four-hourly feeding is made. The easiest way to do this is to shorten it a little each night, finally substituting a few teaspoonfuls of warm boiled water if baby still wakes for a feed.

All feeds should be given in a quiet room as a baby is easily distracted. The mother



IN MISCHIEVOUS MOOD

(Marcus Adams)



SUNSHINE AND EXERCISE

Babies learn to crawl before they are nine months old, and should be encouraged to exercise their limbs in the sunshine.

and her baby should both be thoroughly comfortable. She should use a low chair with a footstool, and a cushion on the lap is often required. Everything necessary should be ready to hand so that she may have twenty minutes completely undisturbed. In feeding, the breast should be held back between the first and second fingers, so that the baby is able to breathe freely and does not get the milk too easily.

DIFFICULTIES ENCOUNTERED IN BREAST FEEDING

By **MABEL LIDDIARD**,
Matron, Mothercraft Training Society.

MANY of the minor difficulties encountered by the nursing mother can be avoided by proper preparation of the breasts during the early months. Depressed nipples will have been drawn out and formed into proper shape: slack muscles toned up and the circulation of the blood will have been improved by cold sponging. The skin of the nipple itself will have been hardened by gentle persistent scrubbing. If these precautions have been neglected, and the

mother arrives at her confinement with depressed nipples, she still need not despair. It is not too late to improve them, though skill and perseverance may be necessary. Before feeding baby the nipples may be gently drawn out with a breast pump until sufficiently elevated for the baby to take. In some cases it may be necessary to use a nipple shield for the first half of the feed, but every effort should be made to put the baby to the nipple itself as soon as possible, or the milk glands will lack the stimulation of baby's sucking.

Cracked nipples should never be neglected, as

they form a channel by which infection can reach the deeper tissues. At

Cracked Nipples.

Balsam should be applied. This is a simple but effective remedy, and often no further measures need be taken. If the cracks do not improve, a dressing of perchloride of mercury and glycerine, 1-4000, should be used. When a dressing of any kind is applied, the nipples should be carefully washed with soap and water before feeding. Wansborough metal shields worn between feeds are excellent and very simple to apply.

Scrupulous cleanliness must be observed, for if germs gain entrance, mastitis (inflammation of the breast) of varying degree is caused. A baby should

never be weaned because of this, but the doctor should be consulted as to treatment, the principles of which are rest to the affected part and the prevention of an accumulation of milk by proper emptying of the breasts. In an acute case the baby may have to be taken from the inflamed breast altogether and fed from the one side only. In these cases, after feeding baby

MOTHER AND CHILD

from the one breast, the milk should be removed from the other by manual expression or by the pump. The latter is usually the best method, as it does not stimulate the glands to action to the same extent as the method of expression, and is therefore not so likely to increase the inflammation; also it is not so painful.

Hot, dry wool applied every three or four hours, and a firm, well-supporting bandage, are often sufficient to prevent the spread of inflammation. If the doctor orders hot fomentations, a hole must be cut for the nipple, or the skin is liable to become tender. Hot fomentations are likely to lessen the secretion of milk, and it is therefore best not to have them on too long. It is a good plan to apply one, changing every five minutes, for half an hour, afterwards leaving hot, dry wool in place until the next feed time, when the course of hot fomentations can be repeated.

Even when a definite abscess has formed, which must be opened and drained, it is seldom necessary to wean the baby, though great care must be exercised when putting the baby back to the breast after the scar is completely healed. The baby should be put to the bad side for one minute only at each feed time, increasing the time day by day. It is usually about seven to ten days before the baby can be safely allowed to suck for the full ten minutes.

Leaking nipples are usually due to lack of muscle tone and not

to an oversupply of milk. It is often difficult for the mother with

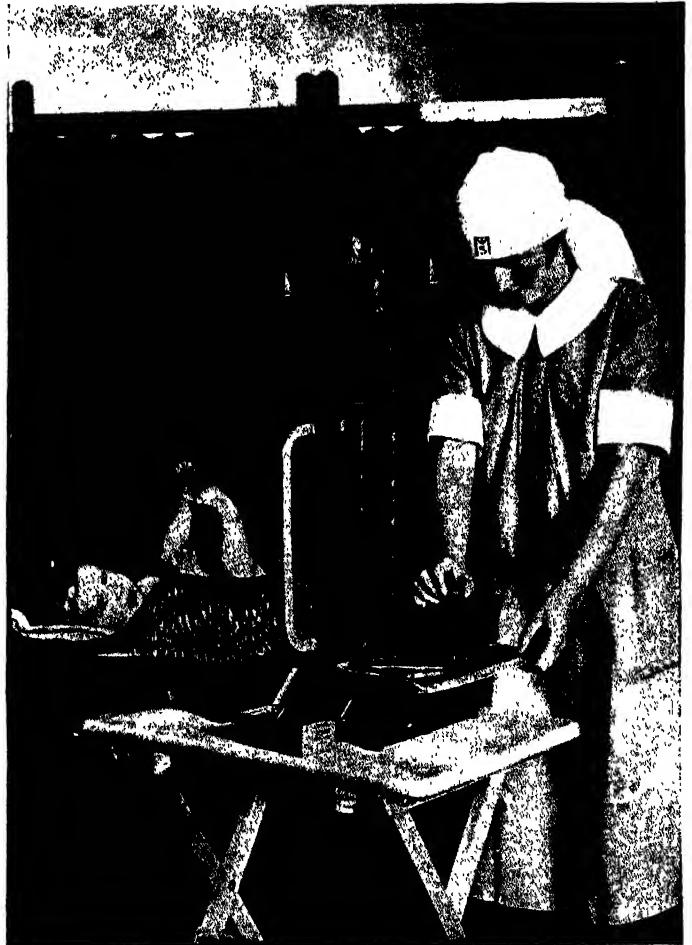
leaking nipples to believe that she has not enough for her baby, but it is often the case, and can be demonstrated by test weighing.

The breasts must be toned up by alternate hot and cold sponging, and by massage. The mother's general health must receive atten-

tion, her diet be regulated, and a definite amount of exercise performed. The discomfort can be relieved by the wearing of glass reservoirs, but these are purely a palliative measure, and will not cure the trouble. Scrupulous cleanliness is essential, as the sodden state of the skin is liable to cause cracks.

During the first few days of lactation the milk may accumulate quickly and in excess of the baby's needs, causing much discomfort. In this case it is sometimes wise to give baby the one breast only, drawing a little off from the other by expression, using the pump if necessary to start the flow, as the breasts will be very tender. If there is no

Early
Engorge-
ment.



A DELICATE TASK

If baby is not making progress, the only way to be sure that he is getting his correct rations is to weigh him accurately before and after the feed.

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danger of overfeeding, the baby should be certainly put to both breasts, as his sucking will empty them more completely than the pump or expression. A supporting bandage, well padded with cotton wool, must be worn, and the mother's intake of fluid reduced until her milk supply is more normal. Hot fomentations are a great relief, and by temporarily reducing the secretion of milk usually end the trouble, but a doctor should be consulted if the condition continues or if the mother's temperature rises.

The reasons why a baby should refuse the breast are innumerable, but in no case are they insuperable, except when there is some deformity, such as a hare lip or cleft palate, which prevents the baby from sucking. In this case the mother must keep her milk as long as possible by sponging and massage, and must express her milk and give it to her baby at regular intervals. A baby who starts life so seriously handicapped needs his mother's milk to an even greater degree than the normal baby. It is better to draw off the milk by hand than to use the pump, as the latter has not such a stimulating effect on the glands. The mother should follow the same routine as if she were actually putting the baby to the breast—drinking extra water, having regular meals of simple wholesome food and taking her afternoon rest. With care and perseverance her milk supply will last for several months. The breast milk which she expresses should be kept covered in a cool place and heated to 100° F. before giving to the baby.

Some babies are difficult during the first week and have really to be taught to suck. It is a very great mistake in this case to begin artificial feeding too soon. For the first three days a normal baby needs nothing but what he takes from his mother and a little extra water, up to 5 oz. a day, if the milk does not come in by the third day. On the fourth, if lactation is still delayed, a small amount of artificial food must be commenced, but under no circumstances should this be given instead of a breast feed or before it. Baby must always be put to

the breast first, and the extra food given afterwards. Lactation is sometimes not fully established for three weeks, especially when the mother is not young.

Great care must be taken in selecting the artificial food and in choosing the teats for the bottle. Too sweet a food or too soft a teat will discourage the baby from taking the breast. Humanised milk mixtures should always be given, and no experiments tried with patent foods or guesswork measuring of milk and water mixtures. Test weighing is the best means of regulating the complementary food so exactly that the baby gains and at the same time is hungry enough to suck willingly at the breast.

The danger of overfeeding during the first few weeks is very great, and except with a premature or feeble baby there is little risk in underfeeding for the first fortnight.

Frequent motions are a sure indication that the amount of food the baby is having must be reduced. If three-hourly fed, the mother should change to four-hourly. The time at the breast must be shortened, some babies taking all they need in three minutes only each side. In order to dilute the breast milk, $\frac{1}{2}$ to 1 oz. of water should be given immediately before a feed. If the trouble does not improve it may be necessary to give $\frac{1}{2}$ to 1 teaspoon of castor oil, followed by a few drops of water only. Water only may be given for twenty-four hours, but usually it is sufficient to give the one water feed only, at the next feed time giving 2 to 3 oz. of water and a very short time at the breast. As the motions improve the water should be reduced and the time at the breast lengthened, but it is wise to continue water before feeds until the motions are absolutely normal once more.

Some underfed babies will suck at an empty breast in a most deceptive manner, and the mother can only be convinced that she has not enough for him by accurate test weighing. By this means the exact amount down to $\frac{1}{4}$ oz. which the baby has taken at a feed can be correctly ascertained. One test-feed alone

Refusal to Suck.

Over-feeding.

Under-feeding.

MOTHER AND CHILD



THE WATER BABY

[L. V. Stone]

Laying the foundations of a strong and healthy boyhood.

is not sufficient as the amounts vary considerably at each feed time, and a calculation made on one feed can be as much as 6 oz. more or less than the baby is really having in the day.

Test weighing for the first fourteen days is of little use, as the normal baby thrives at first on an amount far below his theoretical needs. If the baby is premature or a bad sucker it may be necessary to test weight in order to make sure that he is not sucking in vain, in which case the milk would have to be expressed and given by hand. If the baby is proved to be underfed the mother can easily increase her supply by carrying out the following instructions :—

- (1) Put baby to *both* breasts, giving a little in a bottle after if necessary, but never give alternate feeds. Express by hand any milk left after feeding.
- (2) Take outdoor exercise every day.
- (3) A cool or cold sponge every morning.

- (4) See that the bowels are regular. A glass of cold water or a raw apple should be taken about one hour before breakfast if there is any tendency to constipation. Eat laxative foods—fruit, vegetables, brown bread, etc. If an aperient is necessary, take 5 to 10 drops of Parke Davis' Liquid Cascara Evacuant three times daily.
- (5) Take at least 2½ pints of extra water in the twenty-four hours.
- (6) Stimulate the breasts by alternate hot and cold sponging twice daily; dry quickly with a rough towel, and rub the breasts from without towards the nipple, always supporting the breast with one hand.
- (7) Take three good meals a day, taking any food which has not given indigestion previously—always include vegetables and fresh fruit.
- (8) Take a complete rest, with the feet up, in the afternoon.

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ARTIFICIAL FEEDING

By DOROTHEA L. FISHER, *Mothercraft Training Society.*

IN a few cases a baby must be fed artificially, either partially or entirely, and the young mother is then usually bewildered by advice from all quarters of varying degrees of excellence. Let her at once ignore all suggestions of starchy or patent foods, and also the newer synthetic foods which have been recently placed on the market. Many an apparently healthy bottle-fed baby of a year old shows distinct signs of rickets or other troubles at three. The intelligent mother will study the whys and wherefores of infant feeding, and will not be misled by attractive advertisements or persuasive agents.

Milk consists of—(1) protein, the body-building element; (2) carbohydrate; and (3) fat, the heat and energy producing elements. In addition to these there are mineral salts and the accessory food factors or vitamins. The milk of different animals varies in the proportion of these food components to each other, and also in the type

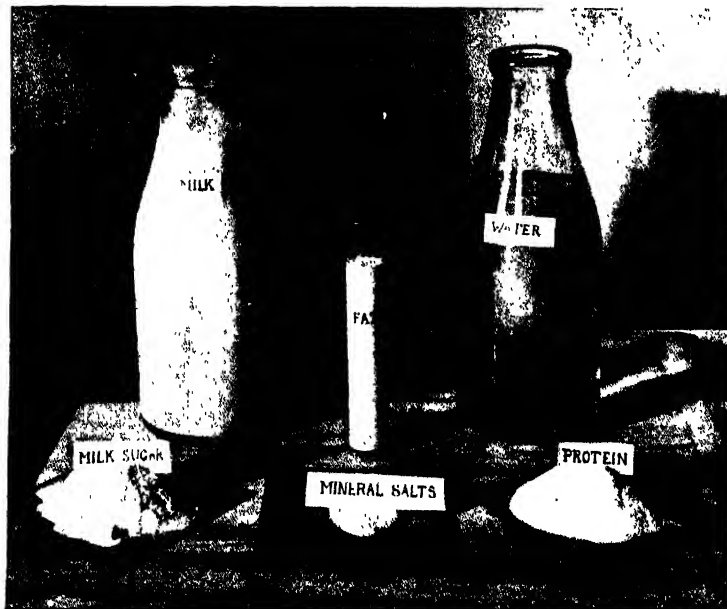
of protein which each contains. Nothing can alter the fact that the protein or curd in cow's milk is more difficult to digest than that in breast milk, but all normal babies can be taught to digest it. Years of experience have given convincing proof of the efficacy of properly humanised milk mixtures. The percentage of protein in cow's milk is considerably more than in breast milk, as can be easily seen by the following figure :—

	<i>Sugar.</i>	<i>Fat.</i>	<i>Protein.</i>
Cow's milk	5.0	3.5	3.3
Human milk	7.0	3.5	1.3

The first step towards humanising is to reduce the protein content to the right proportion. This is most easily done by diluting with an equal quantity of water, thus reducing the percentage composition to 2.5, 1.7, 1.6. The 1.6 protein may be considered sufficiently close for practical purposes to the 1.3 of breast milk. After dilution, fat and sugar must then be added to bring the proportions again to those of breast milk.

There are many recipes for humanising milks, as each baby must be treated individually. Different varieties of fat and sugar may be used; lime water is usually added to make the curd more flocculent, and the mixture which the baby has previously been having must also be taken into consideration. The normal healthy baby, however, should do well on the above mixture, the proportions of which need not be altered from the age of three months up to ten months, provided the amount is increased as the baby grows older.

The best form of sugar is lactose, or sugar of milk. It is



FOOD CONSTITUENTS IN A QUART OF MILK

Cow's milk contains more protein (the body-building element) and less sugar than breast milk, but has the same quantity of fat.

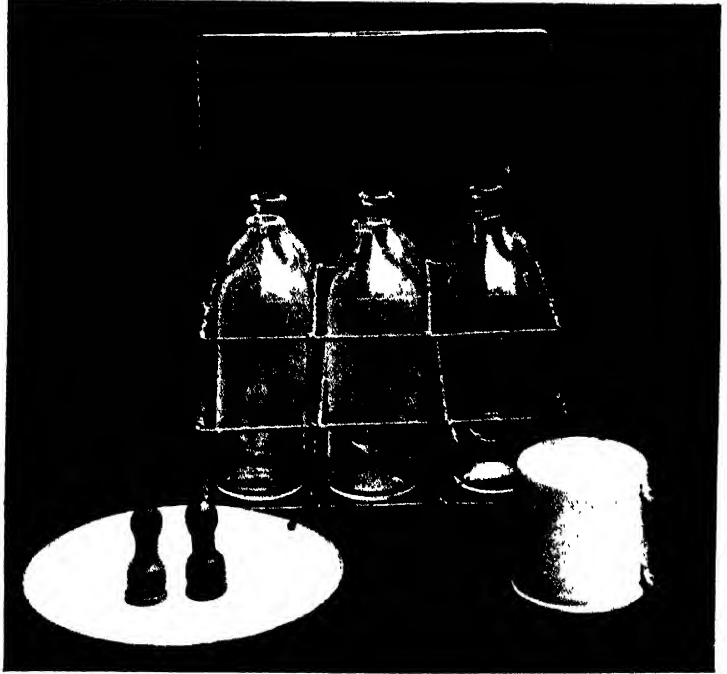
MOTHER AND CHILD

very easily digested, and is not so likely to cause fermentation in the intestines as Sugar. cane sugar. Most babies, however, when in good health, can digest the latter, and it is very much cheaper than the lactose. Malt sugars are of use for underweight babies, but it is best for the mother to consult doctor or nurse before using them, as the slow gain in weight may need more drastic measures than a mere change in the kind of sugar. Foods containing starch should never be given under six months, as until then the digestive ferment dealing with it is absent, and the process of converting it into sugar before digestion cannot take place. A large number of patent foods must be avoided for this reason.

The kind of fat to be added to a baby's mixture needs very careful consideration.

It is an essential part of the mixture, not merely an addition for a weakly baby. Without it the mixture is equivalent to partially-skimmed milk, which no mother would think of giving to her baby. Cow's cream is not the most suitable. It is very difficult to be certain of the exact proportion of fat which it contains, and it is also apt to be preserved. Top milk mixtures are the best method of using cream itself, and some babies digest them well and make excellent progress. The milk should never be taken from entirely stall-fed cows, or the fat may be deficient in the necessary fat soluble A and D vitamins which are essential factors in preventing rickets.

When using unset milk and adding the fat separately, the mother must be careful to obtain a suitable emulsion. Pure cod-liver oil may be given if the baby can digest it, but usually an emulsified form is more easily assimilated. Some emulsions are made up with mineral salts, some do not



EQUIPMENT FOR FEEDING BABY

There should be enough bottles to last the day and the wire cage can stand in cold water. The teats should have a bulb at the end.

contain more than 30 per cent. fat, and others contain a large proportion of sugar and very little fat. It is really better, therefore, not to waste money on patent preparations but to buy the pure oil or a 50 per cent. cod-liver oil emulsion or New Zealand cream. The latter is a very finely divided emulsion of several fats, including cod-liver oil, and is specially prepared for infant feeding. It is extremely easily digested by the most delicate babies, but the special recipes issued with it must be used or the proportion of fat and sugar in the mixture will be ill-balanced and the baby may be upset.

The composition of practically every patent food now sold is well known, and there is therefore no excuse for using them in unsuitable cases, or for changing from one food to another without any definite reason.

Patent foods may be formed of dried milk with some ingredient largely increased, or with some added substance, or they may be entirely synthetic foods not even founded on milk. The latter have not yet been on



[Courtesy]

[The Mothercraft Manual]

HEATING THE BOTTLE

A bottle with a flat bottom will stand in a jug.

the market long enough for us to know what the children reared on them will be like at school age—the great testing time for development and general stamina.

Pre-digested foods should not be given for any length of time. If a baby is ill enough to need a pre-digested food, a doctor's advice should most certainly be sought.

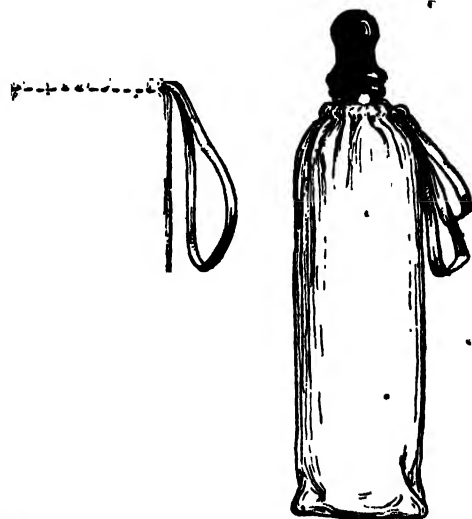
The use of sodium citrate or other methods of softening the curd in the milk should be purely a temporary measure, to be gradually omitted as the digestive glands become capable of doing their full work. In any case the use of citrate of soda should not be continued for more than three weeks without medical advice, after which time it should be reduced by two grains every other day from the day's supply of milk mixture. The practice of giving whole milk or a mixture containing a larger quantity of milk than water, adding citrate of soda to it in order to help the baby to deal with the protein, is quite clearly condemned by Sir F. Truby King in *Natural Feeding of Infants*. "The fatal objection to the use of 'whole cow's milk' for babies—whether 'citrated' or sold in tins (dried or condensed)—is the fact that the great excess of proteid overtaxes both the digestive organs and the kidneys, by

Artificial
Aids to
Digestion.

imposing on them from two to three times their proper daily work. The usual results during infancy are constipation and indigestion, diarrhoea, malnutrition, impaired growth, kidney trouble, etc. If the child grows satisfactorily for a time on such wrong feeding, the mother flatters herself she has done no harm—she takes no account of predisposing her child to penalties and disabilities later in life. *We are always punished sooner or later for disobedience to the Laws of Nature.*"

Many dried milks are excellent and, provided they have not been added to in any way, are very suitable for infant feeding if good fresh milk is unobtainable. There are several varieties of dried milks on the market, amongst them several humanised dried milks. The latter are excellent in many ways, if the baby's digestion is capable of dealing with them, but their expense is an obstacle, and from an educative point of view it is far better for the mother to make her own mixture. Another objection to ready humanised milks is the impossibility of altering one ingredient to suit the baby's temporary needs. The ordinary dried milk can be humanised by the same method as fresh milk, *i.e.* by the addition of the

Dried
Milks.



[Courtesy]

[The Mothercraft Manual]

A COSY BOTTLE COVER

A flannel bag keeps the mixture warm during feeding.

MOTHER AND CHILD

correct quantity of water and of suitable fat and sugar.

Of sweetened condensed milks nothing can be said, but that they are totally unsuited for infant feeding. No

Condensed Milks. amount of dilution will reduce the sugar to reasonable propor-

tions, apart from the fact that the added sugar is usually in unsuitable form. Unsweetened condensed milks have a very useful place for temporary use, as by the superheating process to which the milk is subjected the fat globules and the protein are so finely divided as to be rendered easy of digestion. A good brand of unsweetened condensed milk properly modified is a useful connecting link between breast milk and modified fresh milk.

The objection to using a superheated food is overcome by providing the vitamins in the form of added fat and orange juice, so that its use may, if necessary, be continued for some months. In all cases, however, it is best whenever possible to use a fresh milk mixture.

The milk used for baby feeding should be taken from a mixed herd—not from one cow—so that the content of fat will remain fairly constant. There is also some risk

in milk from one cow that any infection may be passed in very large doses to the baby. Shorthorn milk is the best,

Fresh Milk.

as the fat in Jersey milk is somewhat heavy and difficult of digestion. Certified or Grade A milk, brought quickly to boiling-point and then quickly

cooled, is the purest and safest milk which can be used.

The object of giving fresh fruit

juice to an artificially fed baby

is to make certain that he has an adequate supply of the vitamin C element, the factor which prevents scurvy. Orange juice is the most suitable as being rich in the C vitamin and at the same time palatable and unlikely to upset any baby. Swede juice is equally rich in the necessary vitamin. Grapes, which used to be largely recommended, are now found to be of much

less value, those grown under glass being useless for the purpose.

Having decided what food she will give her baby, the mother will turn her attention to the practical details. It is best to make up the day's supply at one time, as it is far easier to measure accurately in large quantities than in small, and also it is easier to ensure absolute cleanliness once a day



CORRECT POSITION FOR FEEDING

Mother should hold baby comfortably on her lap with his head well supported, and keep a gentle pull on the bottle.



[Keystone]

CHOOSING HIS OWN DIET

than if each feed were made up as wanted. All water given to the baby must be boiled, and, before making up the mixture, all spoons, jugs, etc., should be washed and boiled or well scalded. Measures must be accurate. Kitchen tablespoons and teaspoons should be used if the amounts are ordered in this way, as these are larger than the spoons marked on the glass measure, and the contents should be levelled with a knife. Ounces of fluid should be measured in a medicine glass or accurate measure jug. The marks given on a medicine bottle are rarely correct enough for the purpose.

The best bottle for all-round purposes is the Soxhlett. This has a flat bottom, so that it can be stood in a tall jug to heat. It has no valve, thus baby is less likely to suck in air or to get his feed too quickly, and there is only one teat to clean. Bottles should be filled with cold water immediately after use, and later washed and boiled. A little

flannel bag to keep on the bottle while feeding baby helps to keep the mixture warm and saves time in reheating the feed for a baby who sucks slowly.

A teat with a bulbous end, such as the Maw's Anti-colic Teat, should be chosen, and two used for each feed: the Teats.

first with a small hole so that while the baby is hungry he will work hard, and the second with a larger but still not too large a hole, to ensure that he finishes the feed in twenty minutes. Babies who suck slowly may need thirty minutes at first, but longer than this should not be taken. With a sick baby at this point it may be necessary to spoon feed, but the healthy baby should be allowed to go hungry until the next feed time when he will be found to take his full ration without difficulty.

After each feed the teats should be rubbed with salt inside and out, and rinsed in cold boiled water. They should then be placed

MOTHER AND CHILD

on a saucer to drain, and covered with a cup to keep them from the light and air. They should be scalded once a day, never boiled. A baby should never be left with his bottle. He quickly forms a habit of lazy sucking, the bottle grows cold, and he will continue to suck after it is empty. The mother or nurse should hold him comfortably on her lap and must keep a gentle pull on the bottle. Sucking is exercise, and very necessary exercise; since the bottle-fed baby has not the same opportunity of using his jaws as a normal breast-fed baby, it is only fair to encourage him as far as possible.

The temperature of the bottle is of great importance. Too cold a food will often give wind and hiccoughs; too hot is apt to injure the lining of the mouth and to delay digestion. The food should be only at blood-heat or just tepid. 100° F. is the right heat, and it is really wisest to invest in a dairy thermometer, which is not an expensive item.

The following are some of the recipes recommended and in daily use at the Mothercraft Centre in Highgate. It must

be remembered that a change in food should never be made suddenly, unless the new food is more easily digested than the old, and that condensed and dried milks are easier for a baby to digest than fresh milk.

There are two ways of changing from condensed or dried milk to fresh milk :—

(1) Replace 5 oz. of the day's supply of the original mixture with 5 oz. of the milk mixture. Two days later replace another 5 oz. and so on until the whole of the new mixture is being given. Always take longer between the changes if the baby is at all upset.

(2) Change directly to the new mixture for the first two days, boiling the fresh milk for twenty minutes. Reduce the time of boiling by five minutes every other day until the milk is not boiled for any length of time but merely brought to the boil and then cooled.

If the baby has been having a food, the composition of which is not known, it is usually wise to begin with a modified condensed milk mixture, changing later, as directed, to the fresh milk mixture.

RECIPES FOR ARTIFICIAL FEEDING

Modified Milk No. 2.

Fresh unboiled unpasteurised milk. Set for four hours in a tall covered jug in cool place. Take off required quantity with conical dipper or tablespoon. Boil before use.

To make 30 oz.—Set 40 oz. for four hours.

Top Milk (boiled)	. . .	13 oz.
Lime Water	. . .	1½ oz.
Water (boiled)	. . .	15½ oz.
Sugar of Milk	. . .	3 tablespoons
<i>or</i>		
Cane Sugar	. . .	2 tablespoons and 1 teaspoon

Modified Milk No. 4

With Cod Liver Oil.

Milk (boiled)	. . .	15 oz.
Lime Water	. . .	2 oz.
Water (boiled)	. . .	13 oz.
Sugar of Milk	2 tablespoons and 2½ tea-	
<i>or</i> spoons		
Cane Sugar	. . .	2 tablespoons
Cod Liver Oil	. . .	3 teaspoons
<i>or</i>		
C.L.O. Emulsion	. . .	6 teaspoons
50 per cent. Fat; no Sugar.		

With New Zealand Cream.

Milk (boiled)	. . .	15 oz.
Lime Water	. . .	2 oz.
Water (boiled)	. . .	13 oz.
Sugar of Milk	. . .	2 tablespoons
<i>or</i>		
Cane Sugar	. . .	1 tablespoon and 2 teaspoons
N.Z. Cream	. . .	6 teaspoons
50 per cent. Fat; 40 per cent. Sugar.		

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Modified Dried Milk.

With Cod Liver Oil.

Dried Milk	.	.	.	2 oz.
Sugar of Milk	.	2 tablespoons and 2 tea-		
or	.	spoons		
Cane Sugar	.	.	2 tablespoons	
C.L.O.	.	.	3 teaspoons	
or	.	.		
C.L.O.E.	.	.	6 teaspoons	
Water (boiled)	.	.	.	30 oz.

With New Zealand Cream.

Dried Milk	.	.	.	2 oz.
Sugar of Milk	.	.	2 tablespoons	
or	.	.		
Cane Sugar	.	1 tablespoon and 2 tea-		
	.	spoons.		
N.Z. Cream	.	.	6 teaspoon.	
Water (boiled)	.	.	.	30 oz.

Modified Unsweetened Condensed Milk.

With Cod Liver Oil.

Unsweetened Condensed Milk	.	.	5 oz.	
Boiled Water	.	.	25 oz.	
Sugar of Milk	.	.	3 tablespoons	
or	.	.		
Cane Sugar	.	2 tablespoons and 1 tea-		
	.	spoon		
C.L.O.	.	.	3 teaspoons	
or	.	.		
C.L.O.E.	.	.	6 teaspoons	

With New Zealand Cream.

U.C. Milk	.	.	.	5 oz.
Boiled Water	.	.	.	25 oz.
Sugar of Milk	.	.	2 tablespoons	
or	.	.		
Cane Sugar	.	1 tablespoon and 2 tea-		
	.	spoons		
N.Z. Cream	.	.	6 teaspoons	

TABLE FOR ARTIFICIAL FEEDING.

Average Weight.	Age.	No. of Feedings.	Ounces at each Feed.	Total in 24 Hours.	COMPOSITION OF FOOD.		Hours of Feeding.	
					Ounces Humanised Milk.	Ounces Boiled Water.		
7½ lb.	At Birth	a.m.	p.m.
6¾ "	3rd day	5	1	5	1¾	3¼	6, 10	2, 6, 10
	4th "	5	1½	7½	3½	4	"	"
	5th "	5	2	10	5	5	"	"
	7th "	5	2½	12½	6½	6	"	"
	8th "	5	3	15	8	7	"	"
7 "	10th "	5	3½	17½	12	5½	"	"
7½ "	3rd week	5	4	20	15	5	"	"
	4th "	5	4½	22½	18	4½	"	"
8 "	2nd month	5	5	25	21	4	"	"
10½ "	3rd "	5	5½	27½	27½	—	"	"
12¼ "	4th "	5	6	30	30	—	"	"
13¾ "	5th "	5	6½	32½	32½	—	"	"
15 "	6th "	5	7	35	35	—	"	"
16 "	7th "	5	7½	37½	37½	—	"	"
	8th "	5	8	40	40	—	"	"
	9th "	5	8	40	40	—	"	"

N.B.—Average birth-weight, 7½ lb. ; usually a loss of about ½ lb. in first three days.

Breast-fed babies require from 3 to 5 ounces less than amounts given above.

(Adapted from *The Expectant Mother and Feeding and Care of Baby*, by Sir Truby King.)

MOTHER AND CHILD

WEANING

By MABEL LIDDIARD, Matron, Mothercraft Training Society.

WEANING is the name given to the change from breast milk to artificial food at whatever time during baby's first year this takes place. A baby should not normally be weaned until the ninth month, and if by any unfortunate chance weaning has to take place earlier, as long as possible should be taken over the actual change. A sudden change from breast feeding to artificial food should never take place. It is bad for the baby, whose digestion is often thoroughly upset for some weeks, and equally bad for the mother. Sudden weaning is one of the most frequent causes of breast abscess, and in any case will give the mother much discomfort. Five weeks should be taken over it, beginning when the baby is nine months old and waiting a week between each fresh introduction of an artificial feed. If the mother's milk quickly diminishes, or if there is any special reason for so doing, as little as three days can be taken between the changes, but if less time than this must be allowed, as when the mother has to be absent, the milk mixture must be diluted

to prevent the baby's digestion from being overtaxed. Begin with half strength, and take a week or ten days' to reach full strength. Menstruation is no reason for weaning, and in the case of a second pregnancy allow three days between the changes so as to complete the weaning in three weeks.

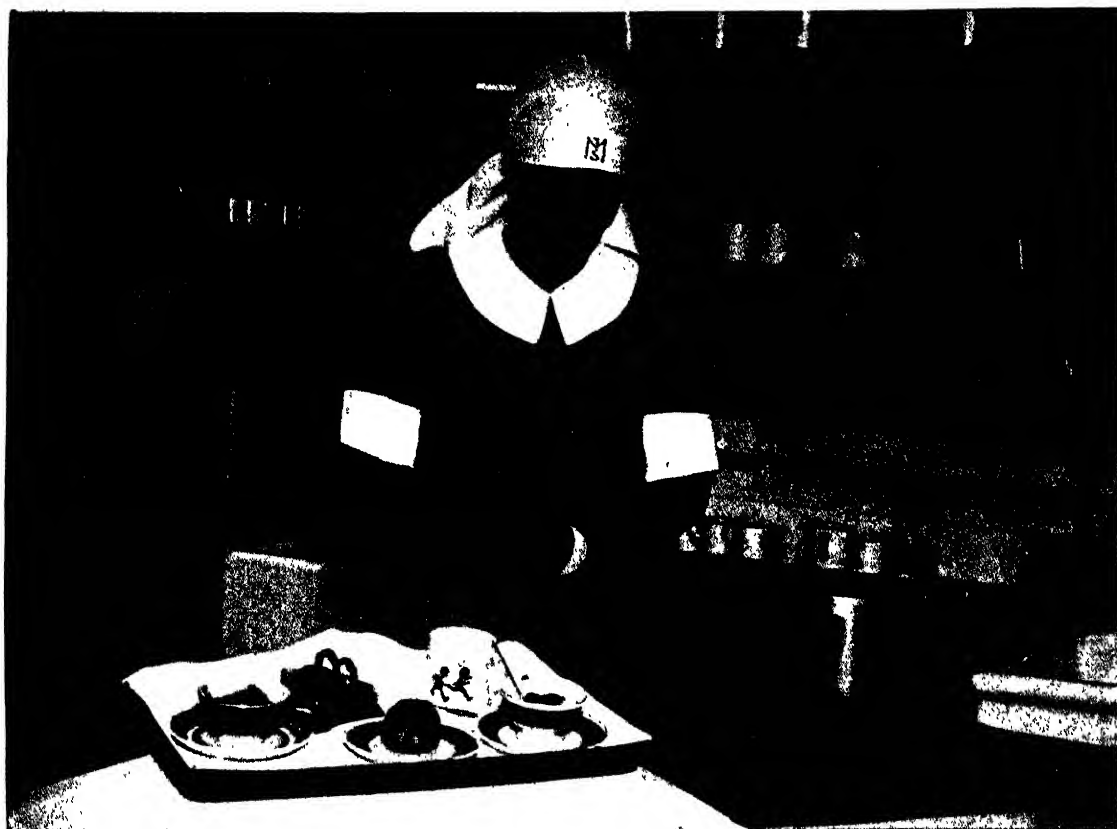
At nine months weaning proper should begin. The breast feed usually omitted first is the midday feed. A normal nine months old breast-fed baby should not be given a bottle, but should be fed with cup and spoon. For this reason it is wise to give

water in a cup and spoon from the earliest days, so that there will be no difficulty with an unaccustomed method of drinking when weaning time comes. This is a very different matter from giving artificial food to a young baby with cup and spoon instead of with a bottle, as this only makes the baby too lazy to suck at breast or bottle. A baby is frequently difficult during the first week of weaning, but it is just a question of patience and of perseverance, of deciding which is to be the master—mother or baby.



BETTER THAN A BOTTLE

A normal baby should be fed with a spoon when weaned at nine months, and not with a bottle.



PREPARING A FOUR-COURSE DINNER

At eleven months baby can have baked crusts, barley or oatmeal jelly, baked apple and milk pudding. Swede turnip juice is a good substitute for orange juice.

Firmness at weaning time is very essential, and the breast should not be given even if for a few days baby definitely refuses the artificial food. Weaning is a necessary procedure, and is made no easier by postponement. If during the second week baby still fights, the two artificial feeds may be given successively, *i.e.* at 2 p.m. and 6 p.m., and it is often found that the baby is sufficiently hungry by the second feed time to give in and take the artificial food quite contentedly. By the end of the second week the mother's milk is probably diminished, owing to the lack of regular stimulation, and baby takes a little less at the breast feeds, so will give no further difficulty over the artificial feeds. Some mothers find it convenient to continue the 10 p.m. breast feed until the baby is a year old, when the feed is given up altogether, instead of having to substitute a cup-and-spoon feed at this hour. It is a

good plan, for as the mother's milk gradually disappears, the baby ceases to look for a feed at 10 p.m. If the mother has discomfort with her breasts during weaning, she should reduce the amount of fluid she is drinking and should bind them up firmly. After weaning, small doses of Epsom-salt may be taken for a few days, if necessary, to stop the secretion of milk.

When cup-and-spoon feeding, the baby should be held comfortably on the lap encircled by the left arm, which can be used to control his movements while the right hand is free to hold the spoon. The milk mixture should be just warm, 100° F., and the cup containing it should stand in a bowl of hot water, as the food is liable to grow cold in an open-mouthed mug. Emulsions and semi-solid foods should always be given first.

MOTHER AND CHILD

Since weaning is in any case a change of food, the mixture given should be easy of digestion. A milk mixture modified to breast milk percentages is best, gradually increasing the proportion of milk to water as the months pass until at seventeen months the baby is having whole milk. Whole milk, though frequently given at an earlier age than this, is a common cause of such troubles as constipation, bed-wetting, night terrors, and general restlessness, indicating an overtaxed digestion. These children become the pale, overstrung type so often scolded for being irritable and difficult over their food. Any of the recipes given in the preceding chapter on artificial feeding for modifying cow's milk can be used, and the following is the method by which the change to unmodified milk is made at the Mothercraft Training Society's Centre.

The quantities given are for a twenty-four hours' supply in each case :—

MILK MIXTURE FOR TWENTY-FOUR HOURS

Eight and Nine Months.

Milk—1 pint.
Sugar—2 level tablespoons.
Lime Water—2 ounces.
Cold Boiled Water—18 ounces.
New Zealand Cream—2 level tablespoons.

Ten Months.

Milk—1 pint.
Sugar—1 level tablespoon and 2 level teaspoons.
Lime Water—2 ounces.
Cold Boiled Water—13 ounces.
New Zealand Cream—1 level tablespoon and 2 level teaspoons.

Eleven Months.

Milk—1 pint.
Sugar—1 level tablespoon and 1 level teaspoon.
Lime Water—1 ounce.
Cold Boiled Water—11 ounces.
New Zealand Cream—1 level tablespoon and 1 level teaspoon.



BREAKFAST FOR ONE

Baby should not be allowed to play with his food, and faddiness should be discouraged.

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Twelve and Thirteen Months.

Milk—1 pint.
 Sugar—1 level tablespoon.
 Lime Water—1 ounce.
 Cold Boiled Water—9 ounces.
 New Zealand Cream—1 level tablespoon.

Fourteen to Seventeen Months.

Milk—1 pint.
 Sugar—2 level teaspoons.
 Lime Water—1 ounce.
 Cold Boiled Water—4 ounces.
 New Zealand Cream—2 level teaspoons.

Seventeen Months.

1 pint of whole milk.

Obtain certified milk if possible. If it comes in a bottle, pour it into a scalded jug and stir well before measuring.
 Directions. Bring the measured quantity quickly to the boil and add the other ingredients.

Scald all utensils, spoons, etc., to be used. Measure carefully—never guess.

When measuring sugar or emulsion use household tablespoon and teaspoon, and cut level with a knife.

NEW ZEALAND CREAM (sugar 40 per cent., fat 50 per cent.).—Measure out the exact amount ordered for the day into a small cup. Give a little before each feed until the day's supply is finished.

Stand jug containing mixture in basin under running water until cold.

Keep cool by standing the jug in a deep basin of cold water. (Change frequently in hot weather.) Cover with wet muslin large enough to allow the four corners to hang in the water.*

Keep in a cool, airy place.

Feed baby regularly by the clock. Give the artificial food in a cup and spoon, not in a bottle. Stir the milk mixture before measuring each feed. Stand the cup in hot water to get warm.

CRUSTS.—A hard-baked finger of bread should be given to baby a quarter of an hour before the 10 a.m., 2 p.m., and 6 p.m. feeds from eight months onward to teach him to masticate.

FRUIT JUICE.—Begin with three teaspoons,

increasing to six teaspoons at a year. Give in equal parts of boiled water at least one hour before or after a feed once daily.

The gradual introduction of solid food takes place at the same time as the weaning, but for several months yet the milk mixture forms the chief part of baby's nourishment and must not be superseded by a large quantity of semi-solid starchy foods. Such foods in small quantities are given chiefly for educative purposes, to teach mastication, to help in cutting the teeth, and to accustom the baby gradually to new tastes. For this reason the crusts, barley jelly, etc., should be started at the right age even if the mother has to continue breast feeding longer than usual, as may happen when travelling or during the hot months of August and September, when it is wisest to avoid a change to artificial food.

At seven months the baby will need something on which to exercise his newly-felt teeth, and for this purpose a well-scraped and boiled mutton cutlet bone or drumstick of chicken is best. This encourages the motion of chewing, and at eight months baby should really have his first lesson in eating. Hard-baked crusts are best for this purpose. They should be made of fingers of bread cut half to one inch thick, and baked hard in a slow oven. At first baby will appear uncertain what to do with this new toy but, if the mother persistently guides the hand holding it to his mouth, within a very few days it will need no urging to its proper destination, though it will be some time before any of it is really swallowed. Rusks are useless for the purpose, as being rapidly softened by the saliva they are swallowed as pap instead of encouraging the action of the jaws, apart from the fact that they contain sugar, and so are likely to upset the balance of baby's diet. A baby should never be left in a room alone with his crust for fear of choking, but he can be laid in a kicking-pen with it and will be quite contented. Crusts should be given three times a day, half an hour before feed time.

By this time baby should possess one or two teeth, or they should be near enough

MOTHER AND CHILD



ENCOURAGING HER TEETH

A well-cooked and scraped drumstick bone is much appreciated when the teeth are coming.

to the surface to be of use to him, and the extra work entailed in biting will help to bring them through. Well-cooked cereals such as jellicd porridge made from oatmeal or barley should be his first attempt. The amount is minute and, from a nutritive point of view, negligible, but the educative value is enormous and the labour of preparation very little. For those who have only a gas ring, a hay box will be found useful to complete the cooking without expense; the porridge should be brought to boil and then left in the hay box for one hour.

As different foods are introduced into the diet, a careful watch must be kept upon the motions to see that the various new foods are being thoroughly digested; if not, the amount must be lessened, or it must be more finely sieved. After 15 months most children can take a fair proportion of their food unsieved, and from the beginning it should always be made into a fairly stiff mixture, bearing in mind the fact that it is "solid" food, not "pap." The following are the diet charts suggested for use with the milk mixture given on pages 141 and 142:—

MIXED FEEDING—NINE TO TWELVE MONTHS

AT 9 MONTHS.—Feed four-hourly—5 feeds. Always give a baked crust about 10 minutes before 3 feeds after 8 months. Commence by giving 2 teaspoons of barley or oat jelly before the 10 a.m. and 6 p.m. feeds, working up to 1 tablespoon before these feeds at 10 months, 2 at 11 months, increasing to 3 at a year.

AT 10 MONTHS.—As above, giving a little well-cooked milk pudding, *e.g.* flaked or ground rice, sago, at 2 p.m., made with milk and water (equal parts). Commence with 2 teaspoons, working up to 3 tablespoons at a year.

AT 11 MONTHS.—Barley or oat jelly at 10 a.m. and 6 p.m.; 2 p.m., mutton broth or gravy and baked crumbs; *or* half coddled egg and baked bread crumbs; *or* steamed custard; *or* vegetable soup; and milk pudding as above. For MILK MIXTURES, follow table.

Leave off the 10 p.m. feed at 11 or 12 months, gradually decreasing until the baby sleeps without any.

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POTATO should not be introduced until baby is 1 year old.

Commence by giving 2 teaspoons of each new food, watching its effect before giving a larger amount.

RECIPES

CRUSTS.—Cut fingers of bread $\frac{1}{2}$ -in. thick each way; bake in a slow oven until crisp and light brown right through. Keep in a tin.

BARLEY OR OAT JELLY.—Mix 2 level tablespoons of Robinson's Patent Barley or Groats for oat jelly into a smooth paste with cold water, add a pinch of salt, make up to half a pint by stirring in boiling water. Boil gently for one hour or cook in a double saucepan. Strain through a wire sieve. Serve warm, without sugar; pour a little milk mixture over the jelly.

VEGETABLE SOUP.—Cut the vegetables, cook in sufficient water to cover them, *put through a sieve*—put back in the saucepan with 1 teacup of milk and a pinch of salt. Thicken with 1 teaspoon of flour. Serve with baked crusts. Use any green or root vegetable.

CODDLED EGG.—Place fresh egg in boiling water, cover and stand aside for 5 to 8 minutes (do not boil); the white should not be set, but like soft jelly.

DIET—ONE TO TWO YEARS

Up to the age of 1 year it is best to keep to the four-hourly feeds, but after that age the meal times can be altered to

suit the convenience of the household. Although the 10 p.m. feed will have come to an end, the child must still be lifted and held out at that hour or bed-wetting will become a habitual and expected thing. On waking in the morning the child should again be held out, and be given the morning drink.

During the second year a more varied diet is begun, but the mother must go slowly

with each new food. Often the texture of the new food seems strange to the child, but after a few attempts he readily takes to it. The only really valuable food which may need to be given with caution is eggs, as sometimes they produce a rash or other symptoms of indigestion. When this is the case the mother should wait a few weeks and then try again, giving a teaspoonful of coddled egg every other day or a little raw egg added to the milk mixture. Meat is quite unnecessary under the age of 2 years, but



READY FOR HIS DINNER

[Typical

vegetables of all kinds can be given as soon as the child can masticate thoroughly. Those containing a coarse cellulose, such as carrots and onions, should be given sparingly or else thoroughly mashed and sieved. Potatoes are best boiled or baked in their skins, as this preserves the vitamins and salts found just under the skin.

After one year a reasonable time should be allowed for a meal, after which the food should be cleared away. A properly brought-up, normal child brings a healthy appetite to a meal, and should not need to be played with or enticed to take his food.



THE AGE OF INNOCENCE

[Fine Arts Publishing Co. Ltd.]

From Sir Joshua Reynolds's famous picture in the National Gallery.

IV

THE GROWING FAMILY

THE CHILD, THE PIVOT OF THE HOME

By *THE VISCOUNTESS ERLEIGH, Vice-President, National Society of Day Nurseries.*

THE rearing of healthy, happy children is of the utmost importance to the nation; no nation can afford to neglect its most valuable asset, the mental and physical vigour of the coming generation. No work is of more vital concern to the State than that of the training of its future citizens.

There is no doubt that the home is the most important factor in the development of the child, and it could equally well be said that the child is the most important factor in the home. What home can be happy in which there is an ailing or fretful child, or one constantly disobedient or contrary? There is no peace in such a home, and the nerves of the occupants become fretted, their tempers suffer, and in consequence the environment becomes less and less suitable or helpful to the child, and thus a vicious circle is created.

When such a vicious circle exists the only remedy is to recognise it, and make a definite break by sending the child away for several months somewhere where he may

have the right environment to correct his faults and build up his strength, while the parents apply a similar process to themselves at home! For such children are nearly always the result of faulty management. The management of children is a

delicate art; some people have a natural gift for it, others can only acquire it through study; some children are easy, others require great skill and patience, and as all children are individual, that which is a success with one may fail hopelessly with another. In one family there will be many variations, and a wise mother will modify her methods to suit each child.

It is a well-known fact that conduct is largely dependent on health, and for good health a

correct diet, fresh air, and sunlight, sufficient exercise and sufficient rest, are essential. But one must not forget the necessary conditions for psychological health; opportunity for self-expression, for action and for experiment, and, above all, a well-ordered and happy environment. All authorities are agreed that the first seven years of a child's



HIS MAJESTY THE BABY

[Lenart]

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life are the most important, that it is then that the foundations of health and character are laid.

One so often hears remarks such as "he is so young it doesn't matter," or "he will grow out of it," or "school will alter all that." The younger anything is the more care it needs, the more tender, the more impressionable and the less articulate it is ; more habits are "grown into" than "grown out of" ; and it is unfair both to the child and the school if the first business which must be tackled is the elimination of faults.

Much is heard nowadays of co-operation between home and school ; such co-operation should begin in the nursery, in order that when school age arrives the child passes from one sphere to the next without nervous or physical disturbance. In his nursery days he should be gradually trained to perform those tasks for himself that he will

have to perform at school ; too often a child is allowed to remain utterly dependent, and then quite suddenly all kinds of demands are made upon him.

The training of a child may be said to begin from the day of its birth, and it is most certain that environment even during the first few months has a great effect on a baby. From its earliest days baby should be part of the home, but not the centre of it : as a child grows older this is even more important. Parents are nowadays so anxious to study the child and do that which is right that children are apt to feel grown-up attention focused on them, which is good, neither for their health nor their behaviour.

A mother should certainly study all there is to know on the subject of child health and psychology, but she should beware of allowing the children to feel that she is constantly observing them, or worse, that she is anxious on their behalf.

GENERAL MANAGEMENT OF THE CHILD FROM BIRTH TO FIVE YEARS

By MABEL LIDDIARD, Matron, Mothercraft Training Society.

ROUTINE OF BABY'S DAY

PEOPL^E often ask why such a hard word as "routine" should be connected with a baby. Though there is some variance of opinion at the present time concerning ordered routine and discipline of any kind, it should not be forgotten that the formation of a habit is a natural outcome of our human nature and that a baby will form habits, good or bad, even if left to his own devices. Surely then the young mother should do her best to guide her baby in the right way, beginning at the very earliest moments to form habits which her wisdom and the wisdom which she has gleaned from others has taught her will lay a firm foundation of character. The routine of the mother's day must perforce vary with her circumstances, but baby's day, whether he be born in a sixth-floor tenement or a West End mansion should be

the same in all essential points. Feeding-times, bath-time, playtime, and mothering-time, with the precious eight hours of rest at night, should be common to all babies, rich or poor.

In discussing the routine of a baby's day it will be simplest to describe that in which the mother has to do everything for him herself, leaving it to the fortunate employer of nurse or nursemaid to decide which duties she can delegate to others. For the first few days the ordering of her baby's life is out of the mother's hands, and if she is fortunate enough to be able to afford a nurse until the end of the first month, baby should be well established in the right ways before she is left alone, and she herself will have been shown exactly how to bath and attend to him.

Feeding-times loom large in baby's life, and it is particularly with regard to these

THE GROWING FAMILY

that one would urge punctuality. Four-hourly feeding is gradually becoming the recognised principle for all healthy

Feeding. babies, though there are certain exceptions when three-hourly intervals are definitely indicated, as with premature babies or in some cases of re-establishment of lactation. Two-hourly feeds are no longer considered advisable owing to the frequency of over-feeding and of failures to continue breast feeding for more than a short time under such exacting conditions. Similarly night feeding as a regular custom is gradually becoming a memory of the past, though it must always be remembered that, as with the four-hourly feeds there are certain well-defined exceptions — notably prematures and in certain types of vomiting babies.

Specifying generally, however, the normal healthy baby does best on five feeds a day with no night feed. Certainly the mother who has undisturbed nights and three-and-a-half-hour intervals during the day in which to cope with her household affairs is far more likely to keep her milk than the mother who spends most of her day and night in feeding or preparing to feed her baby. Baby must be taught the habit of unbroken rest for eight hours at night from the very first, and much therefore depends on the midwife or nurse in attendance, and much also on the mother

during the first few days when he becomes her charge. A few disturbed nights at first are well worth the trouble if they ensure, as they will do, an unbroken series of good nights right up to teething-time when baby may be excused an occasional whimper.

"No night feed" does not mean that baby should be allowed to scream unattended for long periods of time, but it does mean that when he cries it should not immediately

be taken for granted that he is hungry. He is far more likely to be thirsty, to need changing, to be too hot or too cold. A little warm boiled water or dill-water if he has wind will soon hush the crying if he is made comfortable again. Babies are creatures of habit, and once a night feed is started it is extremely difficult to stop.

Most mothers find that 6 a.m., 10 a.m., 2 p.m., 6 p.m., and 10 p.m. are convenient

times, but in any case the first feed of the day should not be later than 7 a.m., making the last feed 11 p.m. It

Hours of Feeding. must be remembered that even if the first feed is delayed or given a little early for some reason, the second should be given punctually at the usual hour, or the whole day will be upset; the consequent agitation and worry for the mother will react most certainly on the baby. A young inexperienced mother may think it cruel to wake a baby for its feed, but she may rest

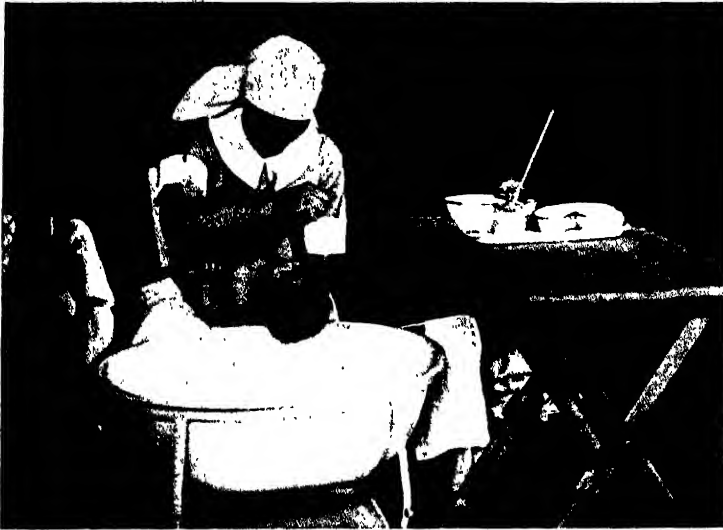


Courtesy

TAKING A LOOK AT LIFE

[Treatise Co. Co.]

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WASHING BABY'S HEAD

Hold baby with his feet towards you, and support his head in your left hand, just over the bath, while washing it with your right.

assured that after a very few days she will not need to do so. He will be awake and ready when she goes to pick him up. Only by a strict adherence to feeding-times can she be certain that a breast-fed baby has his full ration.

Preparations for the early morning feed should be made overnight so that the mother does not have to rise earlier than is absolutely necessary. If the baby is breast fed she

stay in his mother's bed after the feed is over. Apart from the danger of over-laying, which is not at all inconsiderable, there is the whole question of hygiene. Babies are extremely susceptible to streptococcal infections and to catarrh of all kinds, and resistance is further lowered by exposure to an overwarm tainted atmosphere, such as that surrounding the mother's bed at the end of the night. Baby should be put

straight into his cot and tucked in cosily. If garden or balcony is available, he can be put outside at once, except during the winter months, when it is best to wait till sunrise if baby is not accustomed to sleeping out at night. He will then probably sleep undisturbed until bath-time at 9.45 a.m.

During the early months it makes little difference whether baby is bathed at night or in the morning, but the latter is more usually convenient when the baby is fed four-hourly.

Bath-time.



BABY'S BATH

Always lower baby very gently into the water, supporting his head on your left forearm and holding him under the shoulders and back.

THE GROWING FAMILY

Requisites for Bath-time.

- Bath on stand containing cold water.
- Can or kettle containing hot water.
- Baby's basket with change of clothes and clean napkin.
- Bath and face towels, washing cloths, and soap.
- Bowl of warm boiled water.
- Cotton-wool swabs. Receiver for used swabs.
- Chamber and covered pail for soiled napkins.
- Brush and comb.
- Weighing machine if weighing day.
- Olive oil or vascline, if necessary.



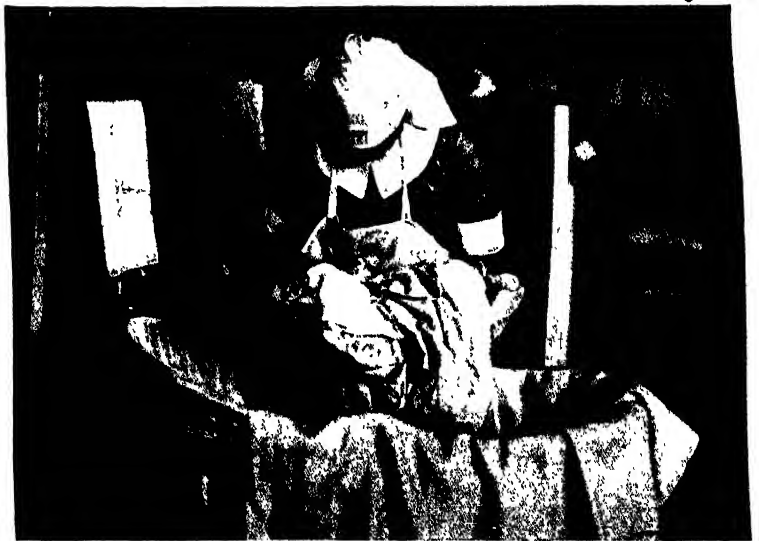
HOW TO DRY BABY

Place a large bath towel on your lap and lay baby upon it. Dry his front thoroughly before turning him over to dry his back.

Everything should be collected in readiness before disturbing him. The room should be thoroughly warmed and the window closed. A screen should be placed to protect the bath from draughts; the little cot-screen is quite sufficient if the room is not very large. All the etceteras should be within easy reach of the low chair in which the mother will sit. If there are facilities for so doing, towels and clean napkin should always be put to warm. It is a good plan to put the cold water in the bath and to keep the hot water in a can or kettle until the last minute. If it is prepared at the right temperature beforehand it will be too cold by the time baby is undressed. The right heat is 100° F., and if a thermometer cannot be afforded, the heat must be tested by immersing the elbow. The hand alone is not sufficient, as it is accustomed to far greater heat than can be borne by baby's tender skin. If baby has a hot water bottle it should be refilled, and the cot made before beginning

the bath, so that it will be ready for him immediately after. Most babies, however, do not need a bottle after the first few days, and it is then better to leave the cot to air while bathing baby and to make it while he is having his "kicking time" before the feed.

The actual bathing of a baby is far better taught by demonstration and practical experience than by book, and every mother should learn how to bath her baby before she



BACK TO HIS COT

Baby's head and back must be well supported whenever he is lifted. Your hand placed under his shoulders will prevent him from slipping.



A BASKET FOR BABY

The upper shelf is for clean clothes, the lower for discarded clothes at bath-time. A handy father could make an excellent substitute with plywood.

leaves the nursing home or before the nurse goes. She should wear a mackintosh apron with bib, and over this a flannel apron. Baby is lifted from the cot and undressed on the mother's knee, his soiled or wet napkin being placed at once in the pail provided for the purpose. If the simple clothes described in a previous chapter are worn, it is possible to undress a baby without turning him over, and the very small amount of exertion caused by slipping the garments over his head does not compare with the rolling process rendered essential by old-fashioned baby-clothes. The arms should be drawn gently out of the sleeves by bending them at the elbow. If the mother owns scales, baby should now be weighed, and she must not forget to have them ready on the table on "weighing-day." He should be wrapped in a warmed blanket, the weight of which must be afterwards deducted. As soon as baby's clothes are off he should be covered with a blanket or the warm bath towel while his head is attended to.

Small twists of cotton-wool wrung out in boiled water are usually quite sufficient to clear the nostrils, but should there be any

difficulty, a little warm olive oil or vaseline may be used. It is of great importance to keep the nostrils clear, and it is often necessary to clean them before a feed, as difficulty in nose breathing makes a baby appear unable to suck.

The eyes should not need any special attention by the time the mother takes charge. Medical advice should always be sought for any discharge from the eyes, and the mother should never attempt to treat it at home. Even the early morning "sleepy eyes" should not be neglected.

More babies' mouths are injured by overcleansing than by neglect. A healthy baby has a healthy mouth in which the natural secretions are sufficient to keep it clean. The lining membrane is so delicate that even the most careful touch may be sufficient to cause an abrasion and to introduce germs. The condition of the mouth is an indicator showing the condition of the mucous membrane lining the digestive tract, and it is useless to apply local treatment only. Thrush needs special treatment which is dealt with later, but the mother whose baby has a healthy mouth will be wise not to interfere with it.

The face should be carefully washed without soap and dried with meticulous care, paying special attention to the ears.



Courtesy]

BABY'S PLAY-PEN

[Treasure Cot Co.]

Useful as soon as baby can crawl, and for many months afterwards.

THE GROWING FAMILY

After attention to the nostrils and face, and before putting baby into the bath, the scalp should be washed and dried. The easiest way to do this is to turn baby so that he lies with his feet towards the mother while she supports his head in her left hand just over the bath. The right hand is then free to soap and rinse the head, taking great care that none of the water reaches the eyes. The head should be

Care of
Scalp.

with the left hand, and splash the soap from his back. After six months, cooler water can be used for this, so as to accustom him gradually to a cold sponge down after his morning bath.

Lift him from the bath, laying him face downwards on the lap and drying his back, paying special attention to the creases at the nape of the neck and in the fat part of the thighs. Turn him over and dry the front of



THEIR FIRST GARDEN PARTY

[Keystone]

dried with the bath towel, as a little friction is good for the scalp.

The blanket or towel is then removed, and baby is rubbed all over quickly and gently with soaped hands, turning him on one side so that his back can be reached. When putting him in his bath, his head should be supported on the left forearm with the hand under the shoulders, the right hand lifting him by grasping the legs just above the ankles. Always lower him gently into the water, as a baby is so easily startled. After washing the soap from the front of his body, turn him over, still of course supporting him

his body, especially the groins and under the arms. Thorough drying is sufficient; powder only clogs the pores of the skin. It is a good plan at this point to lay baby's napkin in place lest he should not choose to wait until the mother is ready to hold him out; the vest is then slipped on and drawn up round the neck. Petticoat and frock are put on as speedily as possible and he is then rolled over to have them fastened and pulled down comfortably into place. Always remember when putting on garments with sleeves, to hold baby's arm by the wrist, not by the fingers only.

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The chamber should then be placed on the mother's lap and baby sat on it, his back well supported against her chest, "Holding Out." and with her hand under his thighs, so that the cold rim of the chamber just touches the buttocks. A blanket should be wrapped round him. By the time baby is a month old he should have learnt what is expected of him, but in any case patience and perseverance will be rewarded, and life-long habits of regularity can be formed by systematic "holding out."

His napkin and socks can now be put on and baby is finished, fresh and clean for the day, the whole process from beginning to end taking not much more than twenty minutes. He can then lie in cot or play with a rattle if old enough to appreciate it, while the mother clears away the bath, tidies the room, and prepares for feeding. If she has a nurse to do this for her she can spend a little time in playing with her baby, surrounding it with the loving atmosphere unconsciously missed by every institution baby, and which only the mother can give.

The ten o'clock feed over, baby goes back to his cot, preferably out of doors, while the mother turns her attention to household duties, including making the feeds, if baby is bottle fed, "and the washing and boiling of the napkins, which should have been soaking in cold water all night. Soda must not be used, as it is liable to cause a rash. Napkins should not be left more than twenty-four hours unwashed, but the mother will find her work diminished if she has sufficient frocks and petticoats to last the week. Woollens should be washed with lux or soapflakes. The latter are cheaper but sometimes contain soda, or the pure Primrose soap may be used. Careful washing and drying doubles the length of life of baby-clothes.

After bath and food, baby will probably sleep until his two o'clock feed, perhaps waking once to be changed and turned over. If he wakes any time after one o'clock a baby over three months old can be lifted from his cot and put to kick on a mattress or in the kicker, well protected from draughts. The

mother should make every effort to lie down for at least half an hour some time during the day.

If there is a balcony or clean healthy space in which the cot can be placed, in the open air, there is no necessity to take out a child under six months, so she will easily manage her rest during the afternoon when other less fortunate mothers are giving baby his daily airing. That taking baby out in his pram gives him exercise is a complete fallacy. He obtains all the exercise he needs during bathing, kicking, and mothering-times. That he is warmer in a moving pram is equally preposterous. It is the person pushing the pram who is warmed by exertion and who takes the exercise, not baby.

The choice of pram may perhaps be conveniently dealt with here. The ideal pram is hard to obtain. It should be well sprung, with ball-bearings, not too deep, and with a ventilated hood. It should be long enough for the child to lie at full length up to the age of 18 months or 2 years.

Go-carts should not be used until the child is capable of sitting up all the time he is likely to be out. There must be a foot-rest and a proper support for the back, and more care must be taken in wrapping the child up than for the perambulator. The deep perambulators so much sold at the present day must have a mattress placed in the bottom for a young baby, as otherwise he is completely shut away from the air, especially if the hood is up and the mackintosh cover securely buttoned up. Our English climate may necessitate the provision of a hood and cover, but let them never be in use one moment longer than is necessary. On a wet day keep baby at home in front of the open window, protected by a screen from the draught of the door, and he will have far more fresh air than in his closed-up pram. Right food and clothing, care and attention are not sufficient without a free supply of oxygen. Slow increase in weight, lack of activity and muscle tone are often due solely to stuffy airless rooms and outings rendered

Morning
Rest for
Baby.

Choice of
Perambula-
tor.

THE GROWING FAMILY



A CONTRAST IN PERAMBULATORS

A deep perambulator (as the one on the right) shuts away the air and is useless without a very thick mattress, so choose a more shallow model for your baby.

useless by the heavy cloud of baby's breath hanging about him under his hood.

After his outing baby goes into cot or kicker, according to age, until it is time for his evening toilet to begin. His mother may pick him up at five o'clock for a little play-time. A certain amount of handling and being played with is both natural and necessary for all babies, and helps in the development of the senses and in strengthening the link between parent and child. The father should be allowed his share in this, and many a man is as deft and gentle with a baby as a woman, but on no account should a baby be over-stimulated by too many caresses; such over stimulation has been proved to be bad for the child's psychological development.

The evening washing is a repetition of the morning bath, except that only face, hands, and buttocks are washed. The clothes should be changed for the night set, and baby fed at 6 p.m., after which nothing

more should be heard from him until 10 p.m. when the last feed is

The Evening Toilet.

given. Baby should be held out as usual before and after this feed and made to take the full time at the breast. If good habits are well established he should then sleep until the morning feed. This may be given soon after 5 a.m. if he wakes and cries, but many babies have to be roused at 6 a.m. The mother, if possible, should be ready for bed before feeding baby as she has had a long day and needs the rest. If she is out in the evening the last feed may be delayed until 11 p.m., but it is better not to make a regular habit of this, as it curtails her night's rest.

The mother who plans her day thus carefully and methodically will go to bed healthily tired, secure in the conviction that her baby after a peaceful, though probably to his mind, quite busy day, will sleep all night.



LEARNING TO CRAWL

MANAGEMENT DURING SECOND YEAR

Food and meal-times have now been dealt with, and next to these in importance come the hours of rest and recreation. A small child needs far more rest than is usually supposed, as every faculty is on the alert during waking hours, every movement brings into play fresh muscles, and every new thing which comes into the range of vision means more work for brain, eye, and hand. The following little table will help the mother in calculating the hours of sleep her baby needs :—

<i>Age.</i>	<i>Hours needed for Sleep.</i>	<i>Hours Awake</i>
1 month . . .	21	3
6 months . . .	18	6
1 year . . .	15	9
4 years . . .	13	11
6 years . . .	12	12
9 years . . .	11	13

At least two consecutive hours during the day should be spent in sleep by the nine-months' old baby, whose exercise is best taken by being put in the kicking-pen or on a rug on the floor to kick for half an hour before the three day feeds. After eight

months put baby on the floor outside the pen so that he may be encouraged to crawl. Up to 2 years this two hours a day rest is essential, and most children will have no difficulty in sleeping all the time. Even if they do not, they should be taught to lie quietly, preferably without a toy or plaything, as rest for both brain and body is needed. The midday rest should be taken out-of-doors, whenever possible, and the town mother may find it convenient to take the pram into some neighbouring park or gardens. This is of little use unless the pram is long enough for the child to lie at full length.

Toys for the baby under two years must be simple, easily washed, and unlikely to splinter. A ball, woolly animals, bricks, and a set of large ninepins are more than sufficient to keep nursery folk happy and contented. Clockwork toys are not suitable. A string attached to the toy motor by which small hands can draw it along the nursery floor gives far more pleasure than the costly mechanism by which it moves of itself.

Weight during the second year ceases to be of such immense importance as a guide to a child's well-being. General activity and development, firmness of limbs and clearness

THE GROWING FAMILY

of the complexion takes its place. Weighing need only take place every month, and the gain in weight is of course considerably slower than during the first year. The average baby doubles his birth weight at six months, trebles it at a year, and should gain 6 to 8 lb. during the second year. A slow, steady increase in weight indicates a more settled state of health than erratic gains. Height is of little importance as this varies so enormously, but the average two-year-old has usually gained about 14 in. since birth. The head measurement is larger than the chest until about the fifth year, after which the chest develops more rapidly.

* The anterior fontanelle, or "soft spot" on the child's head, should be closed by the second year. Delayed closing often indicates rickets. A depressed fontanelle, or sinking of the skin, is a sure sign of ill health, and no time should be lost before consulting a doctor.

At ten months a baby will have discovered how to roll over of his own accord, and the next step is crawling. With a lazy, fat baby it is a good plan occasionally to put his toys or rattle just out of reach so that he has to make an effort to reach them.

Some children stand and walk much earlier than others, but by

fifteen months most children should be able to take a few unsteady steps unaided.

On no account should any child be taught to walk, especially if he is over-weight. As soon as his legs are really strong enough to bear him he will do so of his own accord, and until then he should be allowed to crawl at his own sweet will. A small baby's legs are naturally bowed, but should have straightened by the end of the first year.

At a year old, baby should be able to say a few single words, and by two these should be put together as short sentences of three or four words. A mother

is often over-anxious when her baby is late in talking. Provided he is not silent, but can make sounds of all kinds, there is no need for this anxiety. A baby, especially one brought up with a not much older brother or sister, will often develop a language of his own by which he makes himself understood. This will sometimes persist almost till school age, unless his imitative faculty is strongly developed. It is often merely a form of laziness, and the child can be laughed out of it as he grows older. The mother can help considerably by using correct words instead of "baby language" to the child.



THE FIRST FEW STEPS

Most children are able to take a few unsteady steps by fifteen months.

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THE OLDER CHILD (FROM TWO TO FIVE)

The mother whose baby has arrived at the mature age of two should be able to look back with pride on her record. She may have recollections of mistakes made and of difficulties overcome, but these will be only an incentive to further efforts.

Books and diet charts still surround her, but the advice is even more conflicting than before, and there are very few definite rules laid down for her to follow. The reason for

this is merely because by this time the mother has thoroughly grasped the principles of scientific feeding. Perhaps her simplest plan is to take a diet chart such as the one inserted below. She can then build on this, introducing new foods as occasion arises. Meat is not an essential article of a young child's diet, provided a sufficiency of protein food is given in other ways, such as in eggs, fish, and milk. Lamb, mutton, rabbit, and chicken are the most easily digested kinds of meat, but twice a week is sufficient up to the age of five. Bacon, ham, and pork should never be given earlier.

DIET CHART FOR THE CHILD

Breakfast.

Toast and butter or dripping.
Porridge, ~~Force~~, Grape Nuts, or
Post Toasties.
Marmalade, honey, or treacle.
Milk or cocoa.
Raw apple.

Dinner.

Underdone meat twice a week (or
chicken).
Fish twice a week.
Egg twice a week.
With gravy, potatoes and vegetables,
or vegetable purée.

Puddings.

Lightly steamed puddings.
Milk puddings.
Fruit.
Baked custard.
Light suet puddings.

Tea-Supper.

Toast and butter or dripping.
Plain biscuits and butter or dripping.
Bread and milk.
Junket or milk puddings.



(H.M. King)

INSEPARABLE

Animal toys are always great favourites with children and can, to a certain extent, take the place of a live pet.

this is obvious. Up to the age of two, although all babies vary and must be treated individually, it is still possible to generalise. After that age the variations are so wide, the circumstances of the parents so different, that hard-and-fast rules are impossible, and the mother has to rely largely on her own judgment.

The broad principles will not be new to her. Fresh air, right food, exercise, rest, and healthy clothing are still essential. Diet does not perhaps take the all-important place at this age which it has done previously, but

The great tendency is to give a child too much starchy or sugary foods. A little plain cake may be given at tea-time, honey or jam at breakfast, but if a hard-and-fast rule could be made forbidding sweets it would be a great benefit. In any case, only plain chocolate or pure boiled sweets are permissible, and these should only be given immediately after a meal. The amount of sugar the child needs should be given with his food, and the habit of sucking sweets at all times leads to bad teeth and a disordered digestion.

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THE HIGH SPIRITS OF GOLDEN HEALTH

(Marcus Adams)

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1. Give three good meals a day with no scraps in between.

2. Give 1 pint of milk to drink in the day, and drinks of plain water between meals.

3. Always give some of the hard food first and the softer food afterwards (*i.e.* commence with toast).

4. Fruit and vegetables should be included in the diet every day.

Closely connected with the diet is the management of meal-times. The healthy

child who has plenty of exercise in the open air and who is not accustomed to attention during his meals will be no trouble, except for occasional guidance, if his attention happens to be distracted.

By three it should be possible, though not advisable, to leave the child alone with his meal. If he has to have meals with his parents he should not be treated as a favoured guest; he should be helped last, taught to hand the salt, or even when a little older to pour out the water. The child who monopolises all the attention at meal-times is a nuisance to his parents and to others as soon as he is too old to be thought amusing, by which time the teaching of good manners has become far more difficult. A child should never be enticed to eat or be offered dainties if he will not take his ordinary foods. So-called inherited distastes are sometimes purely imitative, and merely the result of the mother's lack of perseverance in giving that one particular form of food.

Lack of appetite at dinner-time may be due to over-anxiety to return to some game. In this case it is sufficient to make the child sit patiently at the table for the full time usually taken over the meal, whether he has finished or not, so that he soon realises that hurried eating does not set him free any sooner. In any case, ten minutes' rest after each meal is a good plan. Another frequent cause of lack of appetite is over-fatigue.

The daily rest is a necessity. Up to the

age of five every child should have a rest of at least an hour at midday and should be in bed before 6 p.m. The rest should be taken out-of-doors whenever possible.

Increasing activity of both brain and body necessitates more rest—not less—and the child who is irritable and unwilling for bed is usually the very one who needs a longer midday rest.

Over-stimulation and over-fatigue are among the most frequent causes of bedtime difficulties. By the time a child is three he can usually be trusted to wait and call if he wishes to be lifted during the night, but until that time he should always be lifted at the mother's bedtime.

Bed-wetting should be an uncommon occurrence after the age of two, and if it persists the cause should be sought for and removed. In boys it may be due to a tight foreskin, which may necessitate circumcision. The bed clothing should be light and warm, and fresh air at night is essential. Cold sponging the bottom of the back just before bedtime often has a beneficial effect in toning up the muscles, and attention must also be paid to the general health. No fluid should be given after 4 p.m., and the food given at the last meal should be simple and easily digested. A careful watch should be kept for worms, which are sometimes the cause by reflex irritation. No two children are alike, and perseverance and persistent care are usually needed to cure the habit if once formed. The less attention drawn to it the better. With older children especially, a feeling of hopelessness in the matter is very easily inspired, especially if the parents resort to scolding and punishment or allow the child to know they are worried about it. With small children, before it has grown to a habit, a promise of some special toy to play with will often have the desired effect, as sometimes it is merely sleepy forgetfulness or waking that prevents them from calling mother or nurse. It is needless to add that no child should ever call in vain for this reason.

As the child grows older he will of course visit the lavatory by himself, and the mother

THE GROWING FAMILY



[D. M'Leish

THE SEASIDE IN THE CITY

Some of London's toddlers playing in the sand-pit in St. James's Park.

must be careful to see that the daily action is not missed. At a regular time each day after breakfast the child should be given the opportunity, and if the good habits of water drinking and an apple on waking have been continued there will probably be no difficulty. It may be laid down as a definite rule, however, that no child should be allowed to pass thirty-six hours without a motion. Purgatives are not for frequent use, but the trouble should be cured by natural laxative foods such as fresh fruits, figs, prunes and dates, oatmeal porridge and wholemeal bread.

Every child should have a tepid or cold sponge while standing in warm water once a day, preferably in the morning.

Physical Hygiene.

If the reaction to this is not good and the child appears chilled, he should be rubbed instead with a rough towel rung out in salt and water, finishing with a warm towel. This has an excellent

effect and paves the way for the cold sponging later on. Finger and toe nails should be kept scrupulously clean, not forgetting that the toe nails should be cut straight across, and not rounded like finger nails.

Teeth should be well brushed twice a day, using some simple tooth paste or even salt and water. The whole set of twenty teeth should be through by the end of the second year. Great care must be paid to them. If they decay they should be filled and not extracted, for which reason the mother should take her child to the dentist before the tooth is too badly decayed to be saved. After the third year periodical dental inspection every four to six months is a wise precaution. If a first tooth be lost too early the space it leaves is likely to contract, thus having a bad effect on the permanent tooth which is to replace it, and which is already under the gum. Decayed teeth also may



WELL PROTECTED

In winter-time there should be no gaps in the clothing for the cold wind to get through.

infect the second set, and these may have to be filled as soon as they are through.

The hair should be washed once a week, and brush and comb should be kept scrupulously clean. A small toothcomb should be used occasionally, especially if the child is much in contact with strangers or has to be taken in trams or buses.

Clothing should be light and warm, and wide expanses of skin should not be left uncovered. During the winter months long stockings should be worn, and there should be no gap between these and the knickers. A pair of woven combinations, liberty bodice, warm knickers, and tunic or jersey are the most suitable indoor wear, though, until the child has learnt clean habits, vest and pants

must be substituted for the combinations. For outdoor wear, woollen or cloth knickers and a warm coat are ample. Shoes and stockings must be sufficiently large to allow for growth. The shoes should be straight on the inner side of the sole with a broad toe and low heel. The uppers should be flexible and should allow plenty of room for movement of the toes. Laced shoes are best for outdoor wear as soon as the child is big enough to wear them. Gloves are only needed in very cold weather. The first sets should be fingerless.

The two-year-old baby will have learnt that "no" means "no" and "yes"—

"yes," and that crying is not a Education. means of obtaining his wants.

More than this is needed now. The child of three can be really helpful if the mother will allow him to do little things for her. Pushing chairs into place, carrying small articles from one end of the room to the other, dressing and undressing are all part of a child's natural development, and should be encouraged. A feeling of independence and self-confidence is engendered if he is allowed to do things for himself.

Toys should also be chosen with a view to developing some faculty in the child, clearness of vision or deftness of fingers. The simple forms of Montessori "apparatus" are within the reach of every mother. Many can be made at home, and the child will welcome his new playthings with joy.

One great problem is to provide exercise in the fresh air apart from walking. Skipping and hoop bowling are good Exercise. occupations for the only child, while the fortunate possessor of brothers and sisters will always be well supplied with entertainment out-of-doors. If there is no garden available, a sand-pit can be set up in the smallest courtyard and will provide endless amusement and activity.

For more details as to management and behaviour, the mother must turn to such books as *Healthy Childhood*, by Mary Weston; *Your Children*, by Muriel Wrinch; and for help with occupational playthings, Dr. Montessori's own *Handbook*.

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THE HEALTH OF THE CHILD

CHARACTER, FOOD, AND THE CHILD

By **ELIZABETH SLOAN CHESSE**, M.D.,
*Ch.B., Lecturer and Examiner to the London
County Council and to the British Red Cross
Society.*

THERE never was a time when it was better understood that character and happiness are influenced by food. Now parents and teachers are studying dietetics and physiology, and striving to apply their knowledge in school and in the home. The relation between food and health is very close, and the necessity for realising that wrong diet produces deficiency diseases is recognised.

Food supplies material for growth, and is the source of heat and energy. It is transformed by digestion into materials which can be absorbed into the blood; converted, it is the blood and cells of which our bodies are composed. Proteins or nitrogenous foods are very necessary in early childhood when growth is rapid, when the long bones and muscles lengthen day by day; so that eggs, fish, fowl, meat, cheese, and milk, which provide a large proportion of nitrogenous material, must be supplied liberally. A child of five eats half as much as a grown person, and an adult is said to require daily 4 oz. of protein, 3 oz. of fat, and 13 to 16 oz. of carbohydrate (sugar and starch).

The best fats for young children are provided by milk, cream and butter. Young people love butter, and they usually dislike fat of meat, which is unappetising and difficult for children to digest. Suet pudding and dripping are other sources of fat which will be found useful. Children are very active, expending energy all the time, and fats and carbohydrates are sources of energy; thus sugar is an important article of diet in childhood. The ideal sugar is derived from honey in the comb, because it is natural sugar, untouched and unspoiled by civilised man. When it is not obtainable, parents and those in charge

of school dietaries should be careful to buy cane sugar.

Carbohydrates are very useful foods, and they are less expensive than proteins and fats, but there is a danger of giving children an ill-balanced diet with excess of starch and sugar—for example, potato, bread, rusk, cake, biscuit, rice, tapioca, cornflour, all of which are starchy foods. The too fat child, the little boy or girl who is subject to attacks of colds and catarrhs, the irritable, complaining, peevish toddlers are usually the victims of excess of carbohydrates.

Food does affect character and temperament, because the overfed child's brain is nourished with blood full of toxins



[E. A. V. Cusworth]

A TOO HEALTHY APPETITE? .



THE TEMPTER

[E. A. V. Cusworth]

"Children are always ready to break one rule of healthy dieting—"No eating between meals."

(poisons) derived from fermentation of excess of food in the intestine. These cause irritation of the brain cells with a liability to nerve storms and convulsions.

Fruit and vegetables provide the roughage so essential in preventing constipation, the most evil of all bad habits, which begins in early childhood and is the root cause of three-quarters of the ill health in the community, psychological as well as physical. Fruits and vegetables also supply us with mineral salts which are necessary for the blood and digestive juices. If children's diet is deficient in iron and calcium, for example, rickets and anaemia, with defective development of bone and muscle, assuredly follow.

Oranges and apples are perhaps the most valuable fruits we have. Young school children can perfectly well eat an orange and an apple a day, and when these are out of season the less valuable bananas, plums, garden berries, prunes, melon, fresh pine-apple, will give variety and vitamins also. I approve of young fresh salads for quite young children; tomatoes, in season, are especially valuable. I think

some day we shall have flower salads.

Vitamins may give us many surprises in the future.

At present we know Vitamins comparatively little about them. We are told that they are chemical substances of unknown composition, and that they are found in fresh foods—in milk, butter, fruits, salads, green vegetables, meat, fish, fowl. If we supply the children with plenty of milk, butter, fruits, salads, and if, in the winter, we give cod

liver oil also, we can be fairly certain of maintaining an ample vitamin content in the diet.

The amount of food given to children depends not so much upon their age as upon their weight, general development, and individual requirements. My own experience is that children like good vegetable soups, or fish soup with milk stock, or potato soup. They prefer potatoes cooked as they ought to be, in their jackets, and they like puddings which are dainty and served with fruit and cream. I would give three meals a day, with intervals of four and a half hours between them, and I would



ENJOYING THEIR DESSERT

[E. A. V. Cusworth]

Although apples and oranges are perhaps the most valuable fruits we have, there are many others which give variety and vitamins too.

THE GROWING FAMILY

make the menus very varied and full of surprises.

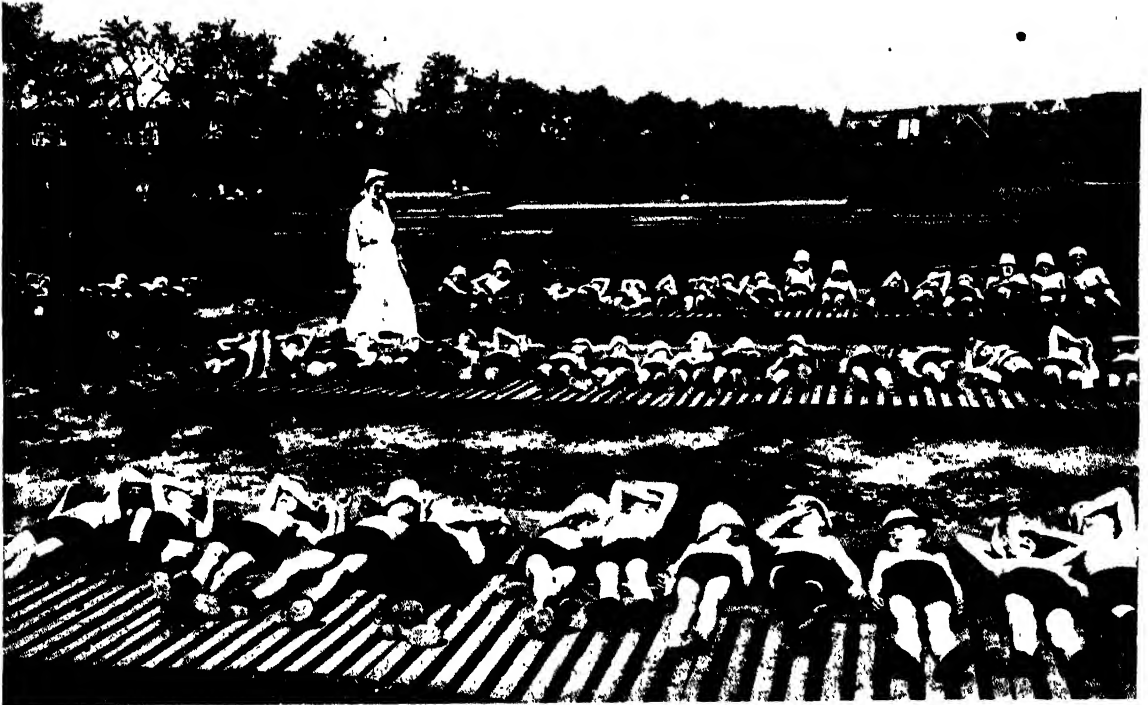
I do not believe that children should be forced to eat food which they obviously dislike. We are all supersensitive to certain foods. We may dislike eggs and have a bilious attack if egg is (even without our knowledge) in the menu. We may be supersensitive to strawberries or to peas or beans or fish. Such supersensitiveness is present from early childhood and is similar

**Antipathies
in Diet.**

HOW MUCH SLEEP THE CHILDREN NEED

By *THE SECRETARIAT OF THE LEAGUE OF RED CROSS SOCIETIES.*

THE sleep requirements of a child vary with age and, perhaps, with climates and the seasons of the year. There are, too, individual differences, one child needing more sleep than another. Professor Terman found that among school children in the



ASLEEP IN THE SUNSHINE

At this school the midday rest is combined with sun bathing.

Keystone

to supersensitiveness to feathers, or fur of cats, which in some people induces asthma.

Apart from sensitisation, children may dislike intensely dishes which they have been compelled to eat when they were feeling ill or when they had no appetite. The sight of the same food will induce nausea for years after, so that it is cruelty to force children to eat food they refuse. Let them take plain bread and butter instead, or, if they prefer it, go hungry till the next meal. The child has as much right as we have to "antipathies."

Western States of America the duration of sleep at various ages was as follows:—

Age	6	7	8	9	10	11	
Hours and Minutes of Sleep	11.14	10.41	10.42	10.13	9.56	10.00	
Age	12	13	14	15	16	17	18
Hours and Minutes of Sleep	9.36	9.31	9.06	8.54	8.30	8.46	8.46

These figures, however, are much higher than those of certain English and German observers, and much below the theoretical figures set forth by Dr. Clement Duke, very

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generally accepted as standard figures. That Professor Terman's figures are too low may be gleaned from the following table, in which he shows the proportion of school children who had to be awakened in the morning—who had, in other words, not had enough sleep :—

Age	6	8	9	10			
Percentage of children who had to be awakened	21	19	23	19	23	20	

Age	12	13	14	16	17	18	
Percentage of children who had to be awakened	24	25	26	32	39	40	48

It is curious that this percentage of heavy morning sleepers increased considerably with age. We all know the sequence of events in such cases. The child is late for breakfast, eats it hurriedly, is late for school, and is not as wideawake and receptive as the child who starts the day with a well-rested body and fresh mind.

The importance of this problem becomes transparently clear when we consider the statements, made on good authority, that very poor children are mentally about a year behind the children of the well-to-do classes, and that this backwardness is chiefly a matter of insufficient sleep. The child who has to share his bedroom and perhaps even his bed with others, who is disturbed in the early morning hours by his room-mates as they dress for work, and whose scanty hours of sleep are further encroached on by the discomforts of vermin and cold is, indeed, handicapped.

It has been said that the problem of sleep is largely a problem of housing and of poverty. The key to the problem is to be found in the evening, whereas it is irrevocably lost in the morning. The child who goes to bed early in the evening should have no difficulty in getting up betimes in the morning. Parents can give incalculable help to their children if they insist on a bedtime on the following scale :—

To bed at the age of 8 not later than eight o'clock. Allow a quarter of an hour's grace for every successive birthday, so that a child of 9 is allowed to stay up till 8.15.

When the child has reached the age of 14, he will have been promoted to a bedtime of 9.30.

It has sometimes been said that one can sleep too much just as one can eat too much. It is, however, very certain that wasteful over-indulgence in sleep is a very rare vice in children. It is, of course, true that children can manage for months, and even years, to do without some of the sleep to which they are entitled, but they are all the time drawing on certain reserves of energy—reserves which are needed for such emergencies as disease, accidents, and overwork, including examinations.

The quality of sleep is, apart from the quantity, most important. How can the children's sleep be refreshing if the bedroom is stuffy, noisy, or the bed so cold that the child cannot relax comfortably? Provided the bedding is warm enough, the windows should always be open.

The quality of sleep also depends on what children eat and drink before they turn in. This is a matter requiring a whole essay all to itself. Suffice it here to say that the child who wolfs so many slabs of cold pork, and washes them down with strong tea or coffee, is going to have nightmare instead of placid dreams, be his conscience in other respects ever so clear.

Home study robs many a nervous child of the necessary sleep. The quality of sleep may also be impaired by obstructive breathing, earache, toothache, etc., and if the parents suspect any such troubles, a doctor should be consulted. Mental troubles must also be taken into consideration. How many hours of wakeful anguish could not numberless children have been spared had they been able at bedtime to confide their woes to some parent or guardian?

CARE OF THE SKIN

By H. C. G. SEMON, M.A., M.D., M.R.C.P., M.R.C.S., House Surgeon, House Physician and Senior Assistant to the Dermatology Department, University College Hospital.

THE great majority of babies are born with perfectly healthy integuments. The thin-

THE GROWING FAMILY

ness and delicacy of the outer or horny cell-layers is very pronounced at birth, and the resistance offered to every form of stimulus or injury of the slightest. A very cursory list of these will include three main groups of agents—physical, mechanical, and chemical or bacteriological. Under the first named we place heat and cold. The most unintelligent mother will avoid draughts at bed or bathing-times, but the ill-effects of

skin can be expected to tolerate unfiltered. Wind and water are two more factors in this group. A cold, dry east wind is to be avoided because a baby's skin cannot produce more than a limited amount of protective grease, and for the same reason it is profitable to substitute rain or distilled water for washing purposes when that from the tap is hard.

In the second or mechanical group we



A HEALTHY COMPLEXION

over-warmth are not so readily appreciated. This may lead to excessive perspiration, with resultant irritation and inevitable complications caused by scratching and infection.

Another important physical agent is sunlight. In moderation and properly administered, the rays of the sun are essential both to health and growth, but in excess and in certain climates and altitudes they are abundantly rich in highly active ultra-violet rays, which no infant's

will first consider clothing. This must be light and airy and of soft though not silky texture. Woolly and fleecy material is best, while for underwear a fine soft cellular texture should be preferred.

To summarise. No infant should be exposed to sudden alterations of temperature, because the mechanism of protection is only rudimentary as compared with the adult, and not able to accommodate itself to rapidly changing external conditions. Extremes either of heat or cold must be avoided.

THE GOLDEN HEALTH LIBRARY

Under the heading of mechanical we have now to consider the effects of scratching. This is a natural reflex, and can be observed in the dog and many of the lower animals which are subject to parasites or other agents of irritation. In some forms of infantile eczema the degree of itching reaches such heights that the little patient's arms have to be mechanically restrained by splints, or pins through the sleeves, to prevent serious mischief. In any case of skin irritation it should be the mother's first duty to cut the finger nails short, and thus render the scratching implement as harmless as possible.

The all-important subject of washing is partly a mechanical and partly a chemical procedure. Every normal human skin is covered by an invisible layer of protective grease. This is insoluble, or nearly so, in water, and is probably designed by Nature for the express purpose of preventing the dissolving action of that element on the skin.

The "sebaceous" or oil glands which manufacture the grease are found all over the body, *except* on the palms and soles. If soaked in water, the skin here soon becomes sodden and whitish in colour from the absorption of water by the surface cells. If the immersion were indefinitely prolonged, permanent damage would be likely to ensue, and from this simple illustration we can easily realise the possible effects on a baby's tender skin of too much washing and soaping.

While, therefore, too much water may be harmful, its reasonable use is not only necessary but directly beneficial to the skin, for the accompanying friction, and the exhilarating effects of differences in temperature are the direct result of the daily bath, which we will now consider in more detail.

The question of the bath is perhaps the most important in our theme. There is no mother or nurse so ill-informed as **The Bath.** to err on the side of omission, but there are many whose ideas of cleanliness overstep the bounds of reason. The doctor is more often faced with skin

irritation produced by the injudicious use of soap and water than from eczema due to a neglect of hygiene. One bath daily is sufficient. A "soft" water—that from a clean rain-tub is the best—or distilled water, should, if possible, be procured for the face. The chemical softeners are mostly too alkaline, and are frequently responsible for rough patches, which scratching, etc., may convert into sores and fissures. The same result may follow the application of medicated or strong soaps. Carbolic soap must *never* be used, and all those which custom or advertisement has prescribed for the washing of linen or household articles are invariably rich in soda or other alkali, and act literally as caustics on the delicate skin of the baby. The best type of soap for this purpose is known as "super-fatted"; it contains a maximum of fat, and yields a copious lather even with tap-water.

On the actual technique of washing a great deal might be written. In the case of a baby the areas which most demand attention are, of course, the buttocks and perineum, the groins and armpits, which should be carefully dried with a soft towel. If a dusting powder is used, it should not be an antiseptic compound, which is just as likely to irritate as to disinfect. What is required is *absorption*, and fine Fuller's-earth, equal parts of pure starch and zinc oxide, or talc powder, is really all that is required.

The importance of careful drying, especially of the exposed parts, can hardly be over-emphasised. The thin film of protective grease has probably just been removed, or at any rate depleted by the toilet, and therefore the chemical action of water and soap, and the drying effect of evaporation from a warm surface such as the cheek, will proceed unchecked and tend to damage the delicate upper layers of the skin.

The occurrence of "scurfy" heads among even the most healthy infants is very common, and the neglect of it is frequently associated with undesirable complications (eczema, etc.). In infants the infection responsible for scurf is almost invariably contracted

THE GROWING FAMILY



[Tenners]

THE FIRST BEAUTY TREATMENT

Two children who have realised that the exhilarating effects of cold water and friction are first essentials for a healthy complexion.

from the mother, especially if she is suckling the child, and scrupulous attention to the condition of her own scalp and skin is therefore essential. A mild dandruff in her own case is quite sufficient to initiate a much more severe condition on the scalp of her young and much less resistant offspring. Frequent shampooing of her preferably shingled head is probably sufficient to mitigate the danger, and if, in spite of this precaution, some scaliness is noted on the baby's head, there should be an immediate recourse to nightly applications of olive oil, containing perhaps $\frac{1}{2}$ per cent. of salicylic acid dissolved in it. In the morning it should be washed out with a very weak sulphur or tar soap, in the bath.

It is more than likely that dandruff or scurf if allowed to become set or chronic at this age may cause various skin troubles in later childhood and adult life.

CARE OF THE TEETH

By **MABEL LIDDIARD**,
Matron, Mothercraft Training Society.

THE proper care of the teeth is gradually becoming recognised as one of the most important assets to health. It is not sufficiently well known that not only are all the milk teeth present in the gums at birth, but that the formation of the permanent teeth begins when the mother is only four months' pregnant. The importance of the right diet and of the hygiene of the expectant mother cannot, therefore, be over estimated. The mother who wishes her baby to have healthy teeth must include fresh vegetables, fruit, and animal fats in her own diet.

The first tooth is not usually cut before the sixth month, but at a year old baby should have six to eight, and by that time a soft toothbrush should be brought into

CARE OF THE EYES

By ERNEST CLARKE, C.V.O., M.D., F.R.C.S.,
Consulting Surgeon to the Central London Ophthalmic Hospital; Consulting Ophthalmic Surgeon to the Miller Hospital and Freemasons' Hospital.

I SHALL only, in a few words, refer to the care of the eyes at birth. The doctor, midwife, or nurse are in control, and the ophthalmia of new-born children is now a notifiable disease. Suffice it to say that in England and Wales 10,000 people are blind through this disease. Watch for the smallest sign of any inflammation or discharge, and immediately obtain the doctor's advice.

Let small children have *large* toys,—a large box of wooden bricks is the best form of toy. Houses and castles can be built and knocked down, and so the constructive and destructive instincts are served. The alphabet can be learnt with these bricks, and addition and subtraction explained by them as the child grows older. Do not let small children sew or thread beads.

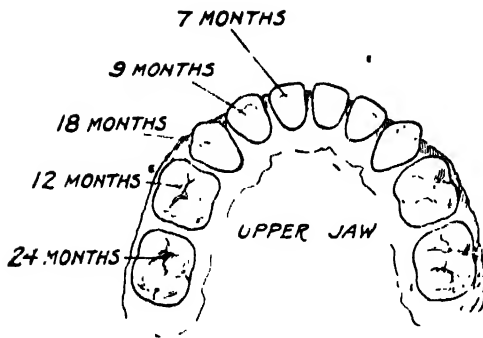
Do not hold anything too near a child's eyes, and do not let a child under five learn to write. Short-sight is often manufactured in the nursery through inattention to these details.

The bed should not face the window. When lying in the perambulator, prevent the sun from shining directly onto the eyes.

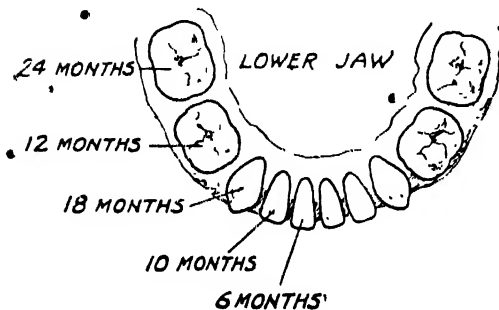
Out of doors the top light, especially when in the sun, should be shaded from children's eyes, and the flimsiest of hats can be worn as long as it has a good brim.

When a child reaches the age, say, of 6 years, the training of the eye and hand may begin, but the greatest care should be taken to prevent the head being brought too near the work or held crookedly when learning to write, as it has been shown to be a most prolific cause of spinal curvature. Under no circumstances should near work be continued for long, and never by artificial light.

The windows should never face the child, and if possible never be behind, but on the left. A skylight is permissible. Artificial light should be well raised or, if near, let



MILK TEETH



THE MILK TEETH

The whole twenty should be in place by the end of the second year.

use. The baby who is breast fed, and who has been accustomed to hard crusts to bite, should cut his teeth with no difficulty. He may not be anxious for his food for a day or two, and may even lose an ounce or two in weight, but this is no matter for worry.

The order in which the teeth are cut is quite immaterial, but the whole twenty should be in place by the end of the second year. The safest form of mouthwash to be used is a weak solution of soda bicarbonate or common salt. This will not harm the child if swallowed, though at the same time it does not make a pleasant drink. The teeth should be brushed up and down as well as across. As soon as the child is old enough, a piece of raw apple should be given after each meal, and the teeth always cleaned last thing at night as well as in the morning, as this helps to neutralise and carry away any starchy materials left clinging to the base of the teeth.*

* See section on "Dental Hygiene."

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it be shaded so that no glare shall reach the child's eye directly.

In the dormitories the beds must be so arranged that they do not face the window.

Reading in bed should be strictly forbidden. Roller towels are always an abomination, but are specially so in a school. One child with a diseased eye can thus contaminate a whole school.

No child under ten should be expected to do home-work or "prep" in the evening, or by artificial light in the late afternoon in winter.

Children often have slight inflammation of the margin of the lids, and scales or scabs are seen along the edge of the lids at the root of the lashes. If this is not treated the lashes may drop out and the lids become distorted. In simple cases, ordinary cleansing may remove this trouble, but, if not, an oculist should be consulted.

If a child rubs the eye, or complains of pain or irritation in the eye, or has a slight discharge, and especially if there is a "fear of light," something is amiss, and a doctor should be consulted. These symptoms may be the beginning of an ulcer which, if neglected, may lead to blindness.

Any blow or injury to the eye should be seen to at once, as delay may be most serious, while immediate treatment may soon put matters right.

Fortunately, now there is, in many small schools, a periodic

examination of the pupils' sight by an oculist, and, when necessary, suitable glasses

are prescribed; but parents should remember that glasses may be called for without any

manifest symptom of bad sight. Head-aches and constant blinking of the eyes are generally signs that the sight should be tested. The glasses must be kept clean, and care should be taken that they are not crooked or bent. They should not be worn at rough games where they are in danger of being broken, as a piece of broken glass entering the eye is most dangerous and often causes the loss of an eye.

Babies very often squint at times; this need not trouble the parents, as it means nothing. Real squint may begin as early as the age of three, but five is generally the age when it is first observed in a child.

If the child is put into suitable glasses at once, the squint may easily be cured, but, if neglected, only an operation can put the eye straight, and that is not always successful. Take the child at once to the eye hospital or to an oculist. A squinting eye gradually becomes blind from non-use.

Finally, I would impress on all those who have the care of children the supreme importance of noting anything abnormal in the child's eyes and obtaining advice at once, as small beginnings may have big endings.



A FINE PAIR OF EYES



Courtesy]

[Tilvertoft Nursery School, Bradford]

AILMENTS OF CHILDHOOD

By *STELLA CHURCHILL, M.R.C.S., L.R.C.P., D.P.H., Medical Director of the Watworth Sunlight Clinic : Author of "Health Services and the Public," etc.*

DISORDERS OF THE DIGESTIVE ORGANS

THE bowels should normally act once or twice a day without difficulty, and, in the first instance, about half an hour after food has entered the stomach. Parents should remember that no amount of exhortation will bring about this result, if the normal reflex action is inhibited, and that all aperients are harmful in so much as they help to destroy and weaken the normal mechanism of the bowel. In infancy this is too often impaired by the administration of frequent doses of castor oil, syrup of figs, and other noxious mixtures.

The first and most important thing to remember is to avoid the subject altogether in front of the child, so that his mind is not centred on the subject of his excretory organs. Unless there is some defective structural disability such as phimosis, *i.e.* tight fore-

skin, hernia, or other congenital abnormality, there is no reason why the bowels should not act daily if the following elementary rules are observed :—

1. Breakfast should contain some cereal such as bran. Where there is a tendency to constipation this should be followed every morning by stewed prunes, raw apple, orange, or banana.

2. Greens should be cooked in very little water, which may be used as the basis for stock, and some raw salad should be given every day. In difficult cases, a meal consisting only of fruit should be given at 6 p.m. instead of the ordinary supper.

3. Plenty of cold water should be drunk through the day, but not at meal-times.

Ample time should be provided for the exercise of this normal function by the school child, as well as adults, and teachers should not be allowed to refuse permission to the child who desires to leave the room for this

THE GROWING FAMILY

purpose. Grave flaws exist in nearly all boarding schools with regard to the prevention of constipation, both as regards the diet which is provided, and the facilities for attending to the calls of nature. Prolonged straining in young children will lead to a very serious condition known as prolapsus ani, or dropping of the large bowel. No child should be allowed to adopt the squatting position for more than five minutes at a time. Another frequent cause of constipation is the unnatural position which the high modern lavatory-seat compels the user to adopt.

Where the above common-sense methods fail to produce a motion, physical methods such as massage and washing out of the bowel, under an expert, are to be preferred to the habitual taking of aperients.

The bulk of medical opinion agrees in believing that constipation is not only exceedingly uncomfortable and unæsthetic, but it may also be the cause of much ill health, such as that associated with inflammation of the appendix, where immediate starvation is the best treatment until there is a suitable moment for operation.

It has been shown with regard to animals such as monkeys, that if they are fed on a diet of cooked and tinned foods they will develop a state of the intestine which is very similar to that which is seen in human beings who live on tea, white bread, margarine, and tinned foods of various kinds, namely, the bowel becomes distended, there is constipation, and germs can be seen passing through the bowel wall into the blood.

The dietaries of many institutions and schools are lacking in sufficient fresh food, particularly in green vegetables, raw fruit, and butter fat, and the chronic constipation from which so many adults suffer can be traced to the neglect of this function in youth.

Diarrhœa is not common in childhood after the first year. It should always be treated seriously by immediate withdrawal of solid food, and the giving of bland fluids such as barley water, lemonade, and egg or rice water. One or two doses of castor oil can

be given at the beginning of the attack, but not repeated, and return to the normal diet should be slow and cautious. Diarrhœa in young children was a very frequent cause of death, particularly in the summer months. In older children, some error of diet must always be suspected. It is important to remember that diarrhœa is often infectious, and to avoid the use of common towels, sheets, etc.

It is remarkable how frequently some children are sick while others may go for years without undergoing this Vomiting. ordeal. Sickness in infancy may be produced by jolting, but, after the child begins to walk, every case of vomiting should be seriously regarded by nurse or mother. Sickness is often the beginning of one of the more serious childish complaints, but it may also be due to indigestion, cold, excitement, or fear. In treating sickness, the golden rule is to give nothing but fluids until the child asks for food, and on no account must food be pressed on the child, either at this or at any other time.

It was formerly the custom to regard a "bilious attack" as inevitable in healthy childhood, but now it must be considered as a sign of ill health. Particular attention should be paid to the smell of the breath, condition of the tongue, temperature and state of bowels, and if there is a sweetish odour in the mouth the child should be kept in bed for at least a day, and be given large doses of sugar and very little food. Should the attack persist, medical advice should be immediately obtained, and the diet carefully observed to see if there is any particular item responsible for the vomiting. It is also important to notice in what condition the food is vomited, and whether it is streaked with blood or slime.

How often it is one hears the statement, "I have to force him to eat." This is one of the commonest causes both of constipation and sickness. If left alone the natural appetite will return in the course of two or three days, and, while food is refused, a child should have as much water as it will take,



[British Continental]

CLEAN TEETH FOR SCHOOL CHILDREN

At this school in the Argentine the children queue up for their toothbrushes every morning and clean their teeth before lessons begin.

and a small dose of fruit salts every morning. Children will often eat oranges or lemons even while refusing other food.

Jaundice is often noticed with vomiting. This is a serious symptom as it means that there is some obstruction in the passage of the bile, and medical opinion should at once be obtained, as the condition is sometimes infectious and may spread through a household.

Decayed teeth are due to a defective diet and lack of attention to dental hygiene.

They may be the cause of much ill health, for where the teeth are not able to function properly, food is not masticated, and constipation and indigestion are the result. Decay in the first teeth before the age of 6 years is by no means unimportant, and should be attended to just as promptly as that in the permanent teeth. As soon as the teeth appear they should be brushed night and morning with a soft brush and hard food eaten at the end of each meal. Moreover, the diet should contain some cod liver oil, or plenty of fresh

butter. Regular visits to the dentist are necessary throughout life, but particularly in childhood, when other defects such as badly shaped jaws can be remedied.

DISORDERS OF THE RESPIRATORY ORGANS

People are at last beginning to realise the wisdom of the famous advice: "Sniff not; blow the nose instead." Even with

Colds and Nasal Obstruction, this precaution some children seem to have obstruction in the nasopharynx (the passage between the nose and the throat), and easily suffer from the repellent complaint known as "cold in the head." Familiarity has bred contempt with regard to this unpleasant ailment, and yet it is the forerunner of serious illnesses such as pneumonia, influenza, bronchitis, and chronic diseases of the lungs, antrum, and frontal sinus.

Prevention of the common cold can be to some extent achieved by the avoidance of overcrowded, stuffy rooms, plenty of fresh air in the day, and segregation of all people

THE GROWING FAMILY

already infected. Once a cold has begun, it is a useful measure to sniff gently up half a teaspoonful of some mild disinfectant such as permanganate of potash in half a pint of warm water through each nostril, passing it out again through the mouth; but on no account should the nose be syringed, as this may force germs into the delicate passages of the head. The same preparation is a useful gargle.

If the cold does not respond to this treatment, the best method is to isolate the patient for two or three days, and see that all discharge from the nose is deposited in paper handkerchiefs and burnt. This is one of the best methods of avoiding infection. Frequent colds are so debilitating, and the cause of so much loss of efficiency, that they should be considered much more seriously than they are at present.

Sneezing is in itself the most hygienic method of cleaning the nasal passages, but

it is even on record that in a well-known girls' school, within recent years, a sneeze was rewarded by a bad mark! The use of irritant powders to provoke sneezing is not to be recommended, but the clearing of the nose every morning on getting out of bed is a very wise precaution, and should be one as much generally observed as the brushing of the teeth.

Bronchitis is one of the commonest causes of chronic ill health among children, and one with which it is particularly Bronchitis. hard to deal in a damp and rather sunless climate. For that reason preventive measures must be undertaken before bronchitis develops. Chief among these, as we have seen, is the proper hygiene of the nose and throat. The avoidance of an excess of starch in the diet, such as bread and potato, will also help to prevent bronchitis in certain children. Too much clothing, lack of fresh air, and crowded rooms are



• LITTLE PATIENTS BUSY WITH CHRISTMAS PREPARATIONS
Child inmates of one of the London hospitals lending a hand with the Christmas puddings.

[Keystone

THE GOLDEN HEALTH LIBRARY

other contributory factors. Sponging of the chest every morning with tepid water is a good way of promoting expansion of the air passages and toning up of all the muscles.

Bronchitis usually begins with an inflamed condition of the trachea, and the child has a short, dry cough. At this stage, if the doctor can give an expectorant mixture the attack may be cut short. In other cases it starts further down in the respiratory passages, or bronchi—hence the name bronchitis.

The best treatment is to keep the child in one room for a few days until the attack has subsided. The medical attendant will prescribe the appropriate drugs, and the attack may be cut short by restricting the diet to fluids and fruit, instead of the old-fashioned treatment of feeding up the patient. Only in cases which have become too severe before receiving treatment is it necessary to have a steam kettle, and inhalants, which were formerly so much in vogue. A child at school is usually too heroic or too shy to complain of an early cough, but if a case goes untreated it may develop into an attack of pneumonia. While heroism in some cases is to be encouraged, we must remember again that "Self-love . . . is not so great a sin as self-neglecting."

The child who "cuts his teeth with a cold" and gets bronchitis whenever the wind changes undoubtedly does require more care than the more robust, but such children are also apt to be coddled and kept indoors so much that their resistance to infection is lowered.

DISEASES OF THE BONES

• Rickets is a disease of the bones which prevents sufficient calcium being laid down so that the bones are softer than normal, and in severe cases this may lead to extreme bending and deformity. While it is rare to see this condition in children to-day, mild cases of rickets are by no means uncommon, and can be prevented by proper attention to hygiene and health. It is no longer the custom to put cases of bone deformity into splints, and the condition is treated by atten-

tion to diet, exposure to ultra-violet light, either from the sun's rays or sources of artificial light, and the avoidance of too much carbohydrate in the diet such as bread, sugar, and potato.

Rickets is known in Germany as the "English disease" and is due to deficiencies in diet and lack of sunlight. There is a popular notion that teething is responsible for many common ailments such as colds, diarrhoea, etc., and while not entirely subscribing to this view, one must remember that teething goes on up to the age of adolescence, so that advice which will prevent rickets and any other condition closely associated must hold good throughout youth. It is necessary to give cod liver oil either as emulsion or pure, during the winter months, but this need not be continued during the summer. Half a teaspoonful after meals for three or four months of the year should be sufficient to prevent rickets if there is also a hygienic mode of living and plenty of fresh air.

Orthopaedic defects (deformities) include many and various conditions frequently due to rickets and also to such various causes as infantile paralysis, tuberculosis, and congenital deformities.

The growing child should be watched every week to see if the spine is in good condition, and that no curvatures are developing which very easily occur at the periods of most rapid growth. Among the more easily discovered effects are :—

1. Spinal curvature, which may be either from side to side or from back to front.
2. Shortening of one leg as the result of tuberculosis, or infantile paralysis.
3. Flat foot, which can develop at any age and pass unnoticed until there is pain. Regular exercises, which are described elsewhere, are preventive.
4. Congenital defects such as dislocation of the hip joint which may sometimes pass undiscovered until the child is 5 or 6 years of age. Children who are not walking well and easily at the age of two should be taken to an orthopaedic specialist.

THE GROWING FAMILY

PARASITES

As soon as the child begins to crawl about and take things off the floor, it probably will get infected by thread worms.

Thread Worms.

These creatures resemble small bits of cotton in the motion, and can be a source of extreme discomfort and loss of weight. They can easily be seen when the child is asleep crawling around the skin of the anus, but if not present then, can

always be obtained, as they are very difficult to destroy.

Even the most cleanly child may at some time in its life get infected with these parasites, either directly through other human beings, or through hotel cushions, railway travelling, etc. The first symptoms are irritation in the head, followed by a rash on the nape of the neck. Small white specks may be seen on



HOW TO AVOID INFLUENZA

[Keystone]

Gargling is useful both to prevent and to treat influenza, colds, and other affections of the throat and nose.

be found in the motion, after a dose of grey powder has been given. It is undesirable to use injections to deal with this condition in children, but a small dose of santonin followed by some liquid paraffin will usually clear up the condition after two or three doses.

These are also frequently found in children. They resemble the common earth worm in shape, and are the cause of great disability to the child who is infected. Medical advice must

Round Worms.

the hair, about the size of a pin's head. These are the nits or eggs of the louse. The condition is easily got rid of by rubbing the hair at night with paraffin, and washing it next morning with Lux or spirit soap. In these days when both boys and girls have short hair it is not necessary to shave the head. The hair should be combed out with a fine comb and the whole process repeated in ten days in order to deal with any nits which may have survived, and which in ten days will hatch out into a live louse. Lice

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are sometimes found on the body, and in order to get rid of them, clothing must be boiled and well ironed on both sides.

Itch or scabies is due to the presence of a small insect which burrows under the skin and may be seen on the back of Scabies. the hand as a small black spot.

The condition is always associated with dirt, but is highly infectious. It is treated by using sulphur ointment on the rash for three days in succession (if applied for longer it may lead to inflammation of the skin), and all clothing must be destroyed or boiled.

MISCELLANEOUS

Headaches may be due to a number of causes and should always be considered seriously and not neglected.

A headache is often the first symptom of some infectious disease, and the child who complains of headache should be isolated

from the others, temperature taken, and kept on fluids and fruit. Headaches which are obviously not due to this cause Headaches. may be due to eye strain, and the eyes should be examined to discover if there is any error of accommodation. Constipation is a cause of headache, and so are other disturbances of the digestive tract, such as the so-called bilious attack.

Migraine is not rare in children and persists usually throughout life. The symptoms consist of headaches, black spots Migraine. in front of the eyes, giddiness, and vomiting. They come on quite suddenly; and are only relieved by rest and quiet. This condition is often found in several members of the same family, and much can be done to prevent its occurrence by the correction of constipation, attention to diet, and the avoidance of strain at school or at home.

Boils are exceedingly common among both boys and girls between the ages of

10 and 15. They are

Boils. an indication that resistance to infection is low. This can be improved by fresh air and plenty of green vegetables, raw fruit, and sometimes an iron tonic. With all these precautions it may be impossible to avoid some slight septic condition of the skin, but if the area of inflammation is only the size of a pin's head, a boil can be aborted by touching the spot with a drop of pure carbolic acid. Care must be taken to avoid touching any other region of the skin as carbolic acid burns all tissues with which it comes in contact. When this remedy, however, is not applied early enough, or fails to succeed, hot fomentations must be applied to the boil every four hours until it is ready to be opened with a sterile needle. Care must be taken to see that all matter, including the "core," is removed.

Sleeplessness, far too common a



HEALTHY LUNGS

[Keystone

Breathing exercises in the open air help to develop the lungs and to cleanse the whole respiratory system.

THE GROWING FAMILY

symptom of mild ill health, will arise at any time and often just after Sleeplessness. the child begins to run about. If

the day sleep is persisted in too long, the child will not take sufficient rest at night. Sometimes the child falls asleep early, but is awakened by night terrors, or attacks of screaming. The cause is usually psychological, but may be intensified by indiscretions of diet, such as cheese for supper or other unsuitable food. The remedy for night terrors is to deal with the psychological problem by endeavouring to find out its cause, and seeing that the child's last meal consists only of fruit and water.

Older children often find it very difficult to get to sleep owing to the pressure and excitement of school work, cold feet, stuffy bedroom, hard or sagging mattress, and many other causes too numerous to mention. Whatever the cause, sleeplessness should always be very seriously regarded and not treated as a matter of minor importance. In trying to avoid insomnia, the greatest care should be taken to avoid mentioning the subject. Nothing is more fatal than to say to the sleepless person, "I hope you will have a good night." The subject should not be discussed, but the assumption made that the child will sleep quite well, whilst the physical conditions are carefully studied without his knowledge. Over-fatigue is a frequent cause of sleeplessness, and there is a continuous struggle with the young to get them to bed. As a child remarked, "Why do you send me to bed when I am not sleepy, and make me get up when I am?"

Rheumatism is a vast and extensive subject which is being considered elsewhere in this series, but a word of warning is required to those concerned with the health



[British Continues.]

A CURE FOR SPINAL CURVATURE

An exercise which distributes the weight of the body evenly and strengthens the back at the same time.

of children not to neglect any complaints the child may make regarding pains in the bones or head. So many of these vague symptoms

Rheumatism.

are ignored by mothers who do not wish the child to become fussy about its health. This complaint is associated usually with poverty and damp, but a few cases occur where every care is taken of the child. Especial attention should be paid to the airing of clothes, personal apparel, and bed linen. This is a point which is overlooked in many households where such matters are left to untrained domestic help. Rheumatism must be avoided at all costs, if possible, because it leaves behind it in so many cases permanent injury to the heart. Apart from the question of damp, the proper hygiene of the nose and throat is a preventive, and as in the case of all other diseases, the question of a balanced diet plays an important part. Once an attack has occurred, that child must be kept flat in bed for many weeks under medical supervision.

The lymphatic glands of the body are a chain of defence against infection and if they are swollen it is a sign that some abnormal condition is present. Glands occur all over the body, but are most frequently found

Swollen Glands.

enlarged in the neck or under the chin. The careful mother or nurse will find out when washing the child whether there is any thickening or swelling in this region, and should at once point it out to the medical adviser. Swollen glands may be due to such different conditions, as decayed teeth, septic tonsils, skin complaints, tuberculosis, or syphilis.

Glands will also sometimes be found swollen in the groin frequently as a result of an infected wound in the foot. It is astonishing to find how lightly parents will regard a considerable swelling of this nature, which is in itself quite serious, while they are much more concerned over some trivial condition of the skin.

Bed-wetting is a very difficult condition to cure, and may occur in children who have already once obtained control. Enuresis. over their excretions. It is more frequent in boys than in girls, and is often accompanied by masturbation. The greatest care is necessary to ascertain this fact, and more good can be done by a sympathetic talk with the child than by scolding or punishments. Indeed it is extremely unwise to punish severely for this complaint as it is a matter beyond the child's control. Proper attention to the bowels during the day, regular relief of the bladder, and the provision of a non-irritating diet are all-important factors in its prevention. In spite of all these measures, the condition sometimes persists right up to puberty and occasionally into adult life. It occurs in highly strung, irritable children, and is sometimes helped by administering certain drugs. Many other remedies, including suggestion and hypnosis, have been tried. It is important not to focus the child's attention on to its unfortunate disability last thing at night. During the day it is rare to find this condition except in a very nervous child who is allowed no facilities for leaving the room. A hard mattress, plenty of fluid during the day, but little in the evening, and attention to the general health are some of the best remedies for dealing with this condition.

NURSING THE CHILD AT HOME

Every one in charge of young children should try to equip herself with knowledge on the following points :—

1. The prevention of illness from the outset by proper attention to hygiene and diet.
2. The detection of early signs of ill health.
3. The measures for dealing with symptoms as they occur, with or without the advice of a doctor.

Half the serious illnesses among children arise because of ignorance of these facts, and much permanent damage to health would be avoided if serious illnesses were not overlooked.

The best place for a young child is in its own home, and the best nurse its own mother provided that both of them are of the right type. Some mothers react very badly on their children, being either too careless or too caressing, and in such cases a relation, a child's nurse, or, where she can be obtained, a trained nurse, is the best substitute. Cases of infectious illnesses should only be nursed at home when the child can be kept entirely separate from the rest of the family, and every case of diphtheria should go to the hospital as there may be need for surgical interference at any hour of the day or night.

The signs of illness are various and may be summed up as follows, in the order, more or less, of their appearance :—

- | | |
|-------------------|---|
| Signs of Illness. | <ol style="list-style-type: none"> 1. The child is fretful. 2. Food is refused or vomited. 3. The child may sleep very heavily and be roused with difficulty. 4. The child may complain of pains in the head, chest, abdomen, or limbs. |
|-------------------|---|

On examination it may be noticed that there is some rise in temperature, the eyes are unnaturally bright, the cheeks flushed, and the breath may have a sweetish odour. The skin should be looked at for signs of "spots," and in every case the mother or nurse should look at the throat. It is a good plan to teach quite young children to put out their tongue and let the throat be looked at every day, so that when illness arises the

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throat can be easily seen without a "nerve storm."

Young children should always be kept in bed for twenty-four hours after even the slightest rise of temperature, Treatment, whether the doctor is called in or not.

The room should, if possible, face south or south-east. No child should ever be nursed in a room with a north aspect, as recovery from any illness is much helped by exposure to the rays of the sun. All carpets and unnecessary hangings should be removed from the room, the floor of which must be wiped over daily with either hot water and soap, lysol, or some other disinfectant.

Everything connected with nursing, such as medicines, dressings, etc., should be kept out of the child's sight, and the illness should never be discussed in front of the patient, but warning should *always* be given when anything is going to be done, such as taking a temperature, giving an enema, or opening an abscess, when pain is likely to be caused.

It is a wise plan for every mother to have a medicine chest containing the following articles, and these should be kept out of the child's reach :—

1. *Tincture of iodine*, which can be applied

to any accidental sore or grazed part after the dirt has been well washed out.

2. *Lint, cotton wool, and bandages* for making hot fomentations, which may be used in the case of boils or dirty wounds.

3. *Ambrine* or some form of paraffin wax, which should be applied in liquid state in any case of severe burns.

4. *Boracic powder* or crystals for making lotion.

5. *Zinc and boracic ointment*.

6. *Castor oil*, which must be given in cases of diarrhoea and not to relieve constipation.

7. *Milk of magnesia, grey powders, or liquid paraffin* as aperients.

In children under 5 years of age the temperature is best taken under the armpit, in the groin, or in the rectum (the latter for quite young babies); older children can be safely



[Marcus Adams

A HEALTHY TONGUE—AND PROUD OF IT!

This small boy does not feel any hesitation when asked to show his tongue. The condition of the tongue and throat is a sure indication of the state of a child's health, and should always be examined at the first hint of illness.

trusted to keep the thermometer under their tongue, and in case of any likelihood of infection the thermometer must be soaked at once in a disinfectant solution such as Condy's fluid. The normal temperature is 98.4 F.

It is not easy to take the pulse in a small child, but the fingers can be placed on the big vessels of the neck which is much easier than taking it at the radial artery in the wrist,

Care of the Sick Child.



ACCORDING TO PRESCRIPTION

A good way of administering a dose of medicine to a young child.

and counted for thirty seconds. The normal pulse at birth is 130 beats per minute, by the second year it is 110, by the fifth 100, by the eighth 90, and by the twelfth 80.

The bowels should act twice or thrice a day, and where there is a rise in temperature above 100°, or any chest condition, the child should not be allowed to leave its bed for this purpose. In cases of prolonged confinement to bed it may be necessary to give aperients such as milk of magnesia, liquorice powder, or some form of cascara. Usually the bowels should act regularly with the giving of two or three oranges a day—a very desirable routine in every case of illness. Anything vomited should be kept for the doctor to see.

The child should be washed all over once every day—preferably at night—with warm

water and soap. This should be done even in cases of severe pneumonia, as it helps the skin to work properly.

Nothing is so important to a young child as plenty of sleep. It is Nature's own cure, and should never be interrupted for medicine, food, or dressing of wounds, if this can be avoided. Where children find it difficult to go to sleep it is wiser to say nothing about it when putting them to bed, as the mere suggestion "now you *must* go to sleep" is sufficient to banish it for hours from their eyes.

Always *listen* to a child's complaint of pain. Do not ever say "run away and forget all about it!" Nor must you show too much anxiety. Note the place, kind of pain, and tell the doctor.

Food must never be forced on a child in sickness or in health. Give plenty of lemonade (made with *fresh* lemons) and orange juice. The appetite will return when the fever goes, and then favourite dishes such as fruit jellies, fruit salad, chocolate blancmange, may be given.

The teeth should be cleaned twice daily. In the case of small children the mouth should be washed round with a piece of clean lint, and a mouthwash containing bicarbonate of soda should be used. When possible, the child should be taught to gargle for every case of a "sore throat." One teaspoon of boracic crystals or powder to a pint of boiling water, allowed to cool, should be used to bathe the eyes of a sick child night and morning. It is not desirable to wash out the nose. The child should be taught to blow it always on waking up.

When the illness is likely to spread to others, as in the case of measles, whooping cough, etc., everything used by the patient should be kept apart from the rest of the family, and thorough precautions taken for disinfection. (See section on "Infectious Diseases.")

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CHILD HEALTH AT SCHOOL

SAFEGUARDING CHILD HEALTH

By **L. HADEN GUEST, M.C., M.R.C.S., L.R.C.P.**, formerly Consultant School Medical Officer, London County Council; Honorary Physician, St. George's School Clinic, Blackfriars, London.

AMONG many remarkable advances in medical science in recent years, none is more striking than the application of preventive medicine to the safeguarding of the health of infants, of school children, and of adolescents and young adults. These applications of the ideas of preventive medicine were projected, and experiments with them carried out, in the last few years of the nineteenth century. But the widespread application to child life is an achievement of the twentieth century.

With regard to school children, preventive medicine became widely effective when Parliament passed an Act in 1907 making it the "duty" of all local education authorities to provide for the medical inspection of children in attendance at public elementary schools. During the next few years it became clear that in order that the work of safeguarding child life should be thoroughly carried out, it was necessary to provide not only a special service for inspection but a separate series of institutions for the "preventive" treatment of the defects discovered.

Until the institution of regular medical inspection of school children, the treatment of minor defects with a view to the prevention of their developing into more serious maladies was an unusual and exceptional happening. Carious teeth were frequently allowed to go their way, with the result of inflicting not only harm on

the teeth as an instrument of mastication (not to speak of the æsthetic side of the matter), but harm on the growing body in general. Enlarged tonsils were only treated if they positively thrust themselves on the parents' or doctor's attention. Slight ear disease, including discharge from the ears, was neglected with the frequent result of seriously impaired hearing or even more serious disease, such as acute inflammation of the mastoid. Defects of vision were only corrected if they were accidentally discovered or so severe as to be unescapably obvious. Early signs of threatening tuberculosis and heart disease were not observed. Defects of nutrition showing themselves in



[British Continental

MEDICAL EXAMINATION IN A SCHOOL

School children in Germany undergo a thorough medical examination at regular intervals.

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WEIGHING DAY IN A NEW YORK SCHOOL

[Caption]

Regular weight testing is part of the system of periodic medical examination adopted in many of the American schools.

rickets or in digestive disorders were only treated in their more acute manifestations, while any attempt to improve the standard of individual health among children was confined to rare cases, and, except as an aspiration, sometimes vaguely referred to "the ancient Greeks," was very distinctly regarded as being outside the scope of ordinary medical work and beyond the possibility of application to the general body of school children in the country. In all of these matters medical inspection has revolutionised the medical attitude towards disease among school children, and made great improvements in the health of the children themselves.

What is new about the application of preventive medicine to infants, school children, adolescents, and young adults, is not any special kind of medical knowledge, but the way in which that knowledge is used.

Now the elementary and secondary school

children (for the system has now been extended to publicly provided secondary schools) have, as it were, focused upon them a concentration of medical knowledge with the object of preventing minor defects from growing into serious diseases, and of attempting to create the conditions of a rising and improving standard of child health.

Only one ironical comment falls to be made here. In the matter of medical inspection, and usually in the matter of medical treatment in school clinics, the children attending publicly provided schools are better looked after than some of those in the "Public Schools," both for boys and girls. To give two instances only among some which might be cited, there are still public schools where it is possible for a boy with incipient heart disease to be allowed to overstrain himself at games (he may, in fact, be compelled by school regulations to do so), and where the time-table of hours of study, meals, and games is drawn up without

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reference to the commonsense of medical preventive knowledge.

The new conceptions of preventive medicine make it indeed possible to envisage a condition in which not only will the commoner infections such as measles, whooping cough, and scarlet fever be made rare misfortunes, but in which the growth, physical and mental, of the child will be watched to prevent undue strain and to aid right progress.

A slight degree of rickety deformity of some bones is very common. It usually, indeed, passes without comment as "normal." But far from being healthy or "normal," it most probably indicates a serious defect of nutrition, and therefore of growth, calling for the most careful attention. Again, "slight" constipation in children is very common, especially in "well disciplined" boarding schools conducted without reference to medical opinion, and where the time allowed for the necessary

morning evacuation of the bowels is not sufficient, or too much disturbed by other duties, or rendered difficult by the provision of insufficient W.C. accommodation.

Nor is the elementary truism about a child's energy realised. A child has only a certain definite amount of energy to be expended in any given twenty-four hours, and mental and physical energy both come

from the same supply. If a child works extra long hours at its books or other headwork then it should work correspondingly less at its "play." And if a child is "working" its emotions in connection with some private sorrow in its own home, or because of some personal conflict with a master or mistress, or one of the complex (and to the outsider often almost meaningless) emotional tangles of the adolescent, then again it has so much the less energy for "play" or school work.

To allow a child to be in the condition where it has constantly to whip itself up to



THE COMPETITIVE SPIRIT

[Topical

Lack of proper medical inspection causes many public schoolboys to overstrain themselves in the effort to compete with their hardier companions.

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Courtesy]

YESTERDAY—

[L.C.C.]

This picture of a class in a Bermondsey school in 1894 should be compared with the photograph on the opposite page.

stimulate the production of more "work" of mind or body, is to allow a child to be in the condition where it will get "run down" or even "take" some acute disease. A number of the breakdowns of children at school are caused by this over-stimulation of the working power, and they can only be avoided by having at hand a trained medical inspector who understands this new application of preventive medicine. Fortunately, most boys and girls are equipped with a natural fund of laziness which prevents their being overworked. But obviously better results, from the standpoint of the child, its parents and teachers and the community, would be gained by the more careful supervision of health and work to prevent over-stimulation and therefore allow healthy, and probably more rapid, development.

Once the main principle of the preventive object of medical inspection of school children is grasped, the necessity

Clinics of the provision of special treat-
for ment clinics follows. There is no
Prevention. sufficient provision among medical men engaged in predominantly curative work in private practice or in hospitals or similar public institutions for the carrying out of a great amount of additional preventive work. The preventive work in dealing with dental caries alone has called into existence a whole new dental service in which many thousands of children are now treated every year.

Similarly the preventive work for dealing with defects of ear, nose, and throat, for defects of vision, and for a whole series of skin troubles and allied defects called "minor ailments," has needed the creation

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(courtesy)

[L.C.C.]

—AND TO-DAY

The same class in the same school thirty years later—showing the great improvement due to medical inspection and healthier living conditions.

of special services. The number of children who are found to require "treatment" for various defects at any medical inspection is over 20 per cent.

Taking the 1924 figures for London, and certain areas typical of the country as a whole, the incidence of defects per 1000 children (excluding dental caries) is as follows:—

Defective Vision 62, Nose and Throat Disease 51, Skin Disease 13, Non-tubercular Lung Disease 12, Ear Disease 11, Squint 9, Eye Disease 9, Anaemia 9, Deformities 7, Malnutrition 6, Defective Hearing 6, Enlarged Cervical Glands 4, Organic Heart Disease 2, Disease of Nervous System 2, Suspected Pulmonary Tuberculosis 1, Non-pulmonary Tuberculosis 1, definitely diagnosed Pulmonary Tuberculosis 0.4, Functional Heart Disease 1, Defective Speech 1, and "Other Defects and Diseases" 17.

Many of the defects detailed would not have been discovered apart from a systematic medical inspection but, under the existing procedure, they were observed and the appropriate treatment arranged. Taking the figures for minor ailments, eye troubles, and defects of nose and throat alone, over 900,000 children were treated in 1924, of whom no less than 782,148 were treated in school clinics or under special arrangements made by the local education authorities. As Sir George Newman, Chief Medical Officer of the Board of Education says, "These figures attest the value of the medical service to health and education. They represent a vast mass of cured or alleviated disease, which a generation ago went almost wholly unrelieved. They connote also as regards the children a healthier school population, greater ease of body and

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PLAYTIME AT A LONDON DAY NURSERY

[Keystone]

The foundations of health for the schoolboy and schoolgirl are often laid in the infant welfare centres where children below school age are cared for.

mind, increased concentration and attention, an improved school attendance, and, as regards the teachers, diminished strain and enhanced educational results. Co-existent with these healthier physical conditions is the sweeter and more wholesome school atmosphere contributed to not only by the treatment of personal uncleanness and disease, but by the application of sanitary principles to the school buildings and equipment."

Commonsense, popularisation, and application of existing knowledge to babies have brought down the infant mortality figure by one-half in the past twenty-five years. Commonsense, popularisation, and application of medical knowledge to the safeguarding of child health in schools has resulted in an immense improvement, probably understated as a 33½ per cent. increase of physical efficiency in the last generation.

Special medical examinations and supervision of health conditions carried on during

the last few years in certain private schools under my own care have convinced me that an almost unbelievable physical and mental improvement can be made on existing conditions by an extension of present medical welfare methods. The extension must go in certain definite directions, including supervision of school diet, elimination of constipation as a school disease, preventing fatigue and over-stimulation by watching and securing due balance of physical and mental energies, helping growth by common-sense adaptation of clothing to needs of freedom of movement and maximum exposure of skin to light and air.

The application of preventive medicine to child life is not only a matter of general principles but of detailed application in practice. And with the extension of that detailed application, there is the prospect of a very great improvement in the physique and increase in the mental and bodily vitality of the new generation.

THE GROWING FAMILY

THE HEALTH OF THE SCHOOL-BOY AND SCHOOLGIRL

*By Sir W. ARBUTHNOT LANE, Bart.,
C.B., M.S., F.R.C.S.*

IF approached in an intelligent manner, the child is at an early age quite able to realise the importance of obeying the laws of health and the great influence they bear upon growth and upon the normal functioning of every portion of the body. A child is not so much ashamed of being regarded as naughty as of being considered stupid. If interested, the child rapidly develops complexes. The habit of regular evacuation should be regarded as an indication of cleverness and intelligence, and, on the other hand, its neglect as stupid.

I would urge on those in charge of the young of both sexes, and especially of young girls, the vital importance of keeping their bodies in as clean, healthy, and vigorous

a condition as possible, since upon the girl depends the function of producing children, and of nourishing and feeding them efficiently, so that they may become presentable, healthy, useful members of society. Children must be taught to realise that health and beauty are inseparable. The least favoured persons physically may appear to great advantage if their appearance radiates health. The same applies to the capacity for usefulness and happiness.

There should be very little difficulty in supplying children with suitable food. On awakening, the child should be given one or possibly two tumblers of water to drink to purify the blood. Plenty of wholemeal bread, with butter, milk, cream, eggs, fruit, and salads, supply all that is requisite for perfect growth and health. Porridge made of rolled wheat is an excellent article of diet, and one that children usually like.

Butter contains the fat soluble vitamins



A FIELD DAY FOR THE SCHOOLS

[Sport & General]

A view of playing fields at Northampton with over 3000 children giving an exhibition of physical drill.

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A and D, and should be supplied very freely. In particular, vitamins are connected with growth: D vitamin especially is important, as it is concerned in bone formation. If they are absent, the child does not grow normally. Butter is unfortunately costly, but the fat soluble vitamins are contained in whole milk and cream. Milk should be drunk with other foods forming a part of a meal, and not separately. Most other food fats contain much less of the essential vitamins A and D. Cod liver oil is the richest of all foods in fat soluble vitamins. It is only necessary to give a small quantity such as a teaspoonful daily. Given in large quantities, the children get indigestion, owing to the imperfect assimilation of the oil.

Margarine is frequently substituted for butter because of its lower price, but an inferior butter is usually better than the best margarine.

Animal foods, whether flesh, fowl, or fish, are useful in moderation, and their use is only contra-indicated when evidences of imperfect drainage, such as constipation, gastric discomfort, and other symptoms of indigestion are present. While many children find flesh difficult to digest, they can eat fowl with advantage, and a still greater number fish, and especially white fish.

When children are irritable, restless, and troublesome, they are too often regarded as wicked and vicious, and are punished, whereas, these conditions are usually manifestations of unsuitable diet and drainage.

At school the child is exposed in a very large proportion of cases to conditions which are utterly unsuitable to proper growth and development, and wholly dissimilar to those which should have existed in its home.

Its breakfast is often composed of unsuitable articles of food, and the meal is hurried. The lavatory accommodation is usually insufficient. This very bad feature of school life is much less marked in the preparatory schools than in the public schools, where the accommodation and the time allotted for *this vitally important function* are too often criminally insufficient.

This failure to provide suitable accommodation and to insist on its use accounts for what are such serious handicaps in the life of so many of us: lack of initiative and energy, and occasional discomfort or disease.

Again, those in charge of the children are generally imbued with the idea that one action of the bowels daily is sufficient.

There are, however, a few intelligent heads of schools who give the matter their close attention, and who find that the mentality of the children is immeasurably increased by attention to this function.

Before the parents decide on the choice of a school for their child, it is important that they should visit it, inquire carefully as to the details of the diet supplied, the time afforded for the several meals, and, most important of all, they should see the lavatories, learn the proportion of lavatories to the number of the children, the times afforded to each child for the use of the lavatory, and the supervision exerted.

If these vitally important matters are attended to, the brain of the child will be supplied with clean blood, and the brain cells will be in the best possible state of nutrition to receive and assimilate the instructions afforded by the teachers.

That the whole system of education is incorrect is evidenced by the fact that the boy who distinguishes himself most at school is too frequently beaten in the subsequent struggle for existence by one who has displayed no particular talent for learning. The truth of this is well recognised by educationists. It is very likely that the over-stimulated cells of an ill-nourished brain, which has been habitually supplied with blood loaded with poisonous toxins, cease to function efficiently early in life.

Every one must realise that the addition of an adequate quantity of fresh fruits and salads to the diet of the child entails extra expenditure. The vast proportion of those in authority in schools are doing their best, and most conscientiously, to meet the requirements of the health of the child as far as their means allow.

School
Responsi-
bility.

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A LESSON IN FOOD VALUES

[Topical

HEALTH INSTRUCTION FOR THE YOUNG

• By Professor M. V. O'SHEA, University of Wisconsin, Madison, U.S.A.

UPWARDS of thirty years ago, the present writer undertook an investigation of the methods of teaching health—or *hygiene*, as it was called at the time—that were then in vogue in American schools. A survey of the topics that were taught and the manner of presenting them was conducted in rural and urban schools throughout the country. An attempt was also made to determine the results of instruction in this field. Were young people induced to avoid unhygienic modes of life? Were they encouraged to adopt health habits? Was it possible to trace any definite effects in the everyday life of pupils from the facts they gained in the schools? These questions were put to a large number of teachers and parents throughout the country, and many responses were received. This sort of investigation has been continued at intervals since the original inquiry was undertaken thirty years ago.

During these three decades there has been a complete revolution in American schools in respect alike to the topics treated in courses relating to health and hygiene and

to the methods of instruction. This profound change has been based upon certain fundamental principles which have been derived, partly, from a study of the failure of older methods of health teaching to exert a measurable effect upon the health habits of the young and, partly, from the study of child nature in general and of educational and developmental psychology in particular. It has been shown to the satisfaction of all those who have studied the matter that formal, technical study of hygiene has not influenced beneficially the daily life of those who have received the instruction. For instance, there have been laws on the Statute Books of practically all the American States requiring that lessons on the evils of alcohol and nicotine should be given to all pupils, but there has been universal agreement that this teaching has failed almost completely to restrain the young from indulgence in tobacco and possibly even in alcoholic beverages. Instances of similar character and significance could be multiplied *ad libitum*.

There are definite psychological and

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educational principles upon which progressive teachers in America are aiming at the present time to base health instruction.

Children do not spontaneously adopt health habits. The child is the heir of the past.* In his earliest years, he is closer in his impulses to his remote ancestors than to his parents.

His interests are largely primitive. He responds to urges or motives that have not originated in contemporary life. To illustrate: he feels no urge to masticate his food thoroughly, to maintain a healthful posture in play or in work, to preserve his teeth, to avoid occasions and places in which infection of one sort or another may be contracted, to take proper care of his eyes or skin or hair or any other endowment. His remote ancestors gave no attention to these matters; they probably did not need to take any heed of health. Living as they did, out in the open mainly, the exigencies of daily life may have been adequate to preserve their bodily members, and their vigour sufficient for their survival and reasonable well-being.

The child responds to many urges that lead him into conflict with the customs, institutions, social arrangements, and physical conditions of contemporary life. It requires the entire period of development—up to the age of twenty-one, at least, in America—for the individual to grow through certain inherited traits that are out of place in present-day life, and to acquire interests and habits that are suited to existing physical, social, and æsthetic conditions.

There is universal agreement among those who have been studying health instruction during the past three decades that the typical child actually resists formal teaching designed to affect his habits. If he be told that he must clean his teeth regularly, he demurs, or at any rate he readily forgets. Nature seems to say to him, "Your teeth will last long enough without any care from you. Crack nuts with them if you wish, and do anything else you like. Do not spend time brushing them. Especially do not think that you must chew some hard food

at each meal in order to keep your teeth in good condition. You had better spend your time in play or in loafing than in using the toothbrush." Nature speaks in a similar vein to the child in respect to practically every health habit. Recognition of this fact has been partly responsible for a complete change in the manner of teaching health to the young.

Anatomical knowledge usually exerts no influence upon health habits. During the progress of the investigation of health instruction referred to **Knowledge not Enough.** above, abundant evidence was secured showing that a young person might complete a course in the anatomy of the human body and not be affected, helpfully in any way in respect to his manner of eating, drinking, sleeping, taking exercise, working, or anything else. The health habits of medical students have been studied, and it has not been possible to trace any beneficial effect from their study of anatomy upon their health practices. Further, the study of physiological processes apparently leaves a pupil largely neutral in regard to healthful living. American educators have become thoroughly convinced that the mere acquisition of knowledge relating to the human body is of negligible value so far as its effect upon health habits is concerned.

Fear is not a deterrent in unhealthful living. It was formerly thought by American teachers, and also by all American parents, that if a child were warned of the danger of neglecting his teeth, for instance, he would be made thoughtful and careful concerning them. So it was the practice universally to say something like the following to children: "If you do not brush your teeth every morning and every night, it will not be long before you will lose them; worse than this, they will become terribly painful; you will have toothache which will hurt so much that you can hardly stand it. The only way you can avoid suffering is to look after your teeth every day. How would you like to have to eat your food without any teeth? That's what you'll come to if you don't

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use your toothbrush every morning and every night."

This sort of instruction is passing out of the schools and out of some of the homes, because there is abundant evidence to show that such teaching makes but little impress on a child. It does take effect in some cases, but it is just as apt to make children morbid as to be of service to them. So there is a concerted effort, founded upon sound psychology, to develop ideas of health and the

admiration, and respect. A person whose esteem and affection for his organism are awakened through a knowledge of its wonderful construction and the extraordinary feats it can be made to perform will be stimulated to adopt a programme of daily life, if he be shown how to do so, which will keep body and mind in condition so that he can derive the greatest amount of comfort and service from them.

Throughout a course in hygiene and



Courtesy]

[Lilycroft Nursery School, Bradford]

MAKING A GAME OF IT

These children are taught to appreciate cleanliness at an early age.

Practice of health habits by positive instead of by negative or fearful methods.

The first aim in a course in hygiene and health should be to impress the young with

the marvellous construction and still more marvellous capabilities of the human body and mind.

A child or a youth will keep his body and mind in fit shape for the varied needs of life only if he has a high regard for them. He should be led to think of his body and mind as constituting a marvelously adaptable, sensitive, and efficient mechanism which is worthy of his devotion,

health, stress should be laid upon habits of life which will best promote physical and mental well-being and efficiency. But sufficient attention should be given to physiology and anatomy to constitute a secure basis for the health principles that are inculcated. Young persons should be taught the anatomy and physiology of the heart, the lungs, the muscles, the bones, and all other organs and tissues only for the purpose of arousing their interest and admiration. Whenever and in whatever connection anatomy and physiology are treated, the structure of organs must be

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made subordinate to their service or their function in enabling one to accomplish the aims of his life, and there should be presented only data that pupils can understand and appreciate in their relation to healthful living.

The child should be taught to place much confidence in the *natural requirements* of body and mind. For instance, he should be guided largely, though perhaps not wholly, in the choice of food and in the amount consumed by the demands of an unspoiled appetite.

He should be guided to the conclusion that if one lived in a wholesome way his appetite would be a safe guide in respect to food, and in trusting it he would not overeat or undereat. But the pupil should be led to see that we are living under artificial conditions to-day; our life has become very complicated, and it is not easy to follow a programme of natural, healthful living. The result is that the organs of the body are often not well developed and are not maintained in a vigorous condition so that they can resist disease. Appetite is excited in unnatural ways, and if indulged when thus stimulated, trouble may ensue; and so on throughout the details of daily life. The pupil should discover how the body as a whole and its various organs were designed to be used and to be cared for in order that one may get the most out of life, and then he should be led to see how the requirements can best be met under the ordinary conditions of city and rural life.

Particular pains should be taken throughout a course on health to lead the child to think hopefully and cheerfully about his health in everyday life. He should be prevented, if possible, from taking a morbid view of bodily functions and needs. Diseases and disorders of all sorts should be mentioned only when it is necessary in order to impress normal health principles. A child should think constructively about health, strength, good feeling, vitality, and ability to accomplish the undertakings of daily life, and he should not think about disorders of bodily organs or the danger of disease.

There should be no fads and no pro-

paganda in a course in health and hygiene. Every principle of health should be based upon scientific data, though the child should not be burdened with these data. In dealing with the effects on the organs of such drugs as alcohol, tobacco, tea, coffee, and the like, the statements made should not go beyond proven facts. Evils or benefits should not be exaggerated for the purpose of establishing prejudices for or against any habit. This plan should be observed regarding every health principle which is taught in this course. Much stress should be laid on the influence of mental states and attitudes upon health and vigour—cheerfulness, friendliness, purposefulness, hopefulness, and mental cleanliness are essential to good health.

It is an accepted principle of teaching to-day in America that nothing can be learned effectively unless the learner is vitally interested in it, and unless he *uses it* in some way.

A child's everyday experiences and needs—his daily life at home, on the playground, and in places of amusement—should furnish the topics for treatment and also the illustrations of rules of health. Provision should be made for the application of every health principle taught by giving pupils an opportunity to work out practical health problems and projects.

A child learns through the eye more effectively than through words alone, so that photographs, drawings, and diagrams made especially to illustrate health principles should be freely used. He is much more impressed by a dramatic display of a principle of healthful living than by mere exhortation to live healthfully, so that as far as possible health should be played up in little dramas in which those who live in accordance with elementary laws of health feel better, look better, play games better, run faster, have fewer pains and aches than do those who are careless and slovenly in regard to health. Very powerful and enduring lessons can be impressed in this way without the child ever suspecting that he is learning principles of health and hygiene.

V SUNLIGHT AND HEALTH

SUNLIGHT AND ITS INFLUENCE ON LIFE

THE COMPOSITION OF SUNLIGHT

By **PERCY HALL, M.R.C.S., L.R.C.P., Hon. Actino-Therapist, Mount Vernon Hospital; Hon. Consulting Physician, Hull Municipal Light Clinic.**

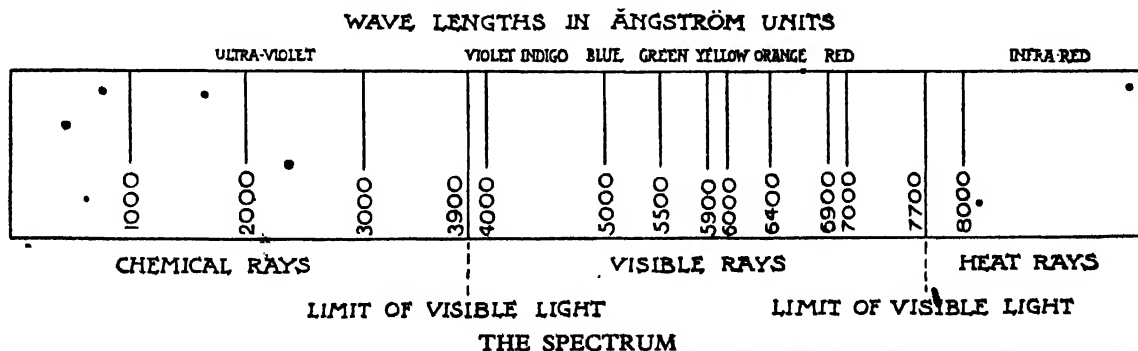
THE sun gives off an enormous number of radiations, which differ in their physical characters, and in their effects. These solar radiations travel to us across the intervening ether until they reach the Earth's atmosphere, which filters out all the harmful radiation. That which reaches us on this planet we call sunlight. Sunlight consists of luminous light, so called because it is visible to the human eye, and, in addition, contains heat rays and ultra-violet rays. It is these ultra-violet rays which play the major part in the so-called Sun Cure, and more detailed explanation of what they are, and what they do, is given later on.

These waves of radiant energy travel to us at the uniform rate of 186,000 miles per second, vibrating and pulsating as they travel. Their physical properties and consequent effects vary according to their wave-lengths and the periodicity of their vibrations. We measure their wave-lengths from

"peak to peak," just as we might measure the waves which break upon the seashore, and which may follow each other in close and rapid succession—as on the east coast—or at longer intervals, as do the majestic breakers of the Atlantic Ocean when they reach the western shores of this country. We measure these wave-lengths in what are known as Ångström Units. An Ångström Unit is the unit of light measurement, and is one ten thousand millionth of a metre in length—something inconceivably smaller than the mere phrase indicates.

That part of sunlight which is visible to the human eye consists of the primary colours ranging from red at the one end, through orange, yellow, green, blue, and indigo, to violet at the other end of the spectrum. It was Newton who first demonstrated that sunlight consisted of a combination of these primary colours by his classical experiment in which he interposed a prism of white glass in the path of a shaft of sunlight, which was allowed to enter a darkened room through a hole in the shutter.

This band of colours constitutes what is known as an octave of light, so called because the waves are pulsating at the



The diagram shows the nature and wave-lengths of the different radiations which, except for the shortest ultra-violet waves, reach us from the sun. Many similar radiations are known, differing from these in wave-length only, so that the Spectrum stretches beyond the infra-red to "wireless" waves and beyond the ultra-violet to X-rays and the pulse-like gamma rays of radium.

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DR. PERCY HALL

violet end at twice the frequency of those at the red end, just as the sound waves vibrating at a certain note have twice the frequency of those at its octave below.

Thus we see that we have one octave of visible light. Below this octave at the red end we have a number of octaves of infra-red or heat rays, which are invisible to the human eye. Their presence in natural sunlight was first demonstrated by Herschel in 1800—who, by holding the bulb of a thermometer outside the visible red rays, recorded a rise in temperature, and thus indicated their presence. Physicists have since demonstrated a number of octaves of these infra-red rays.

Below them again, gradually increasing in wave-length till they reach hundreds of metres in length, are similar waves of radiant energy which are used to-day in broadcasting and wireless telegraphy. Again, beyond the violet end of the visible spectrum are three octaves of ultra-violet radiations, which are also invisible to the human eye. Still farther beyond these are two octaves where the change occurs from "light" to X-radiations. Beyond these again are a large number of octaves of X-rays and the gamma rays of radium.

Only one-half an octave of ultra-violet rays, however, reaches us on this planet, the atmosphere filtering out all the shorter wave-lengths even in the High Alps and

other regions of the earth where sunlight reaches us in its state of greatest purity, and in largest amount.

SUNLIGHT AND ENERGY

By Professor E. C. C. BALY, C.B.E., M.Sc.,
F.R.S., Grant Professor of Inorganic Chemistry at
the University of Liverpool.

THE beneficent influence of sunlight on the progress of life must indeed be obvious to all who take thought of things around them. On the one hand, we see that the living plant depends for its very existence on light, since in the absence of light it wilts and, in the end, dies. On the other hand, the living animal—both man and beast—draws health and strength from that same light, and the truth of this must at once be borne in on us when we see around us the ill health and stunted growth of those who live in sunless courts and eke out an existence made all the more precarious by reason of the dearth of light.

The fundamental origin of the benefit of sunlight to man is to be found in the life-story of the higher plants and trees. This life-story, so far as the influence of light is concerned, is one of fascinating interest.

It has long been known that the higher plants take up from the soil in which their roots are spread simple substances like



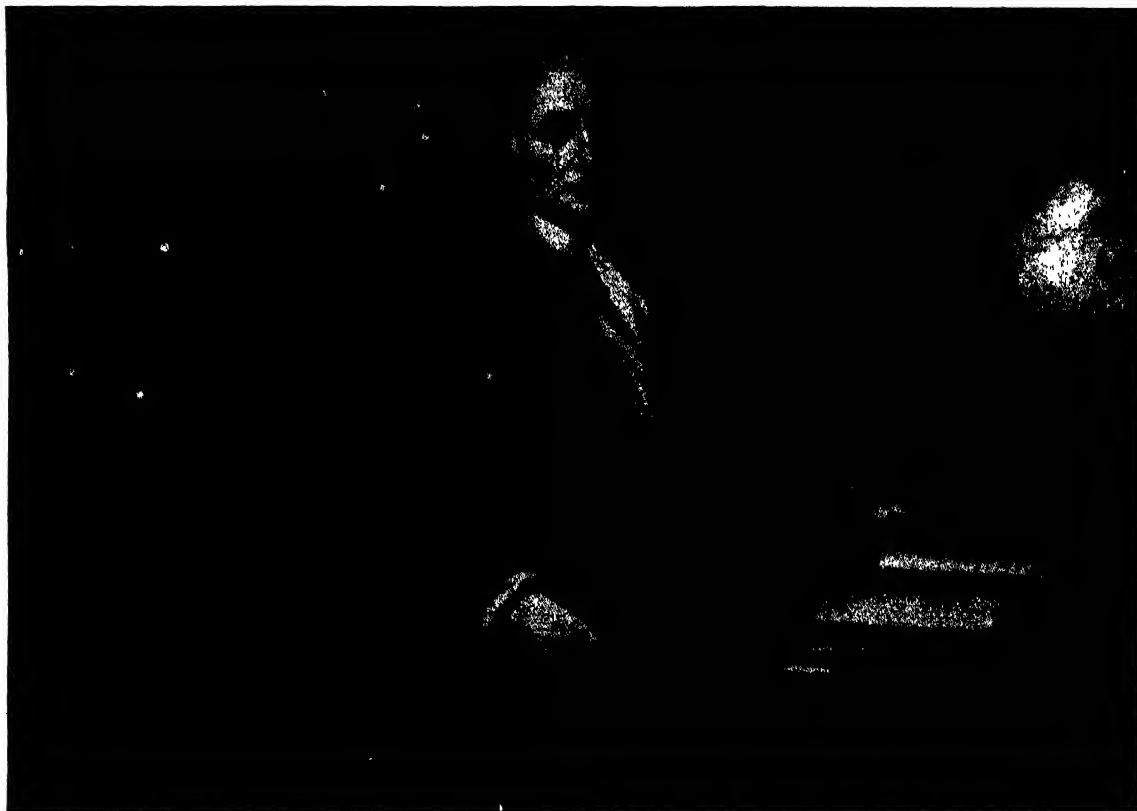
PROFESSOR E. C. C. BALY

SUNLIGHT AND HEALTH

water, and the nitrates and phosphates of metals, such as calcium and potassium, and that these find their way into the leaves. It has also long been known that the leaves absorb carbonic acid gas from the surrounding atmosphere. From these simple inorganic beginnings there are produced in the leaves when sunlight falls upon them very complex substances known as carbohydrates and proteins, names which are

that have already been achieved. I need refer only to one of these results and, stated in very simple language, it is this :—

In general, no substance can take part in a chemical reaction or undergo chemical change unless previously a certain amount of energy has been supplied to it. One of the most familiar methods of giving this necessary quantity of energy is by heating the substance.



SIR ISAAC NEWTON

The famous scientist of the early eighteenth century who first discovered that white light is composed of the series of colours which is seen in the rainbow.

familiar to all who have considered the question of foods and diet.

Until recently, little attention has been paid to the inner meaning of chemical processes—that is to say, how they take place, and why they take place. There now has come into being a new school of chemists who are devoting themselves entirely to a study of this most fascinating problem, and it is remarkable how important are the results

Amongst the more interesting of chemical processes is the group known as photo-chemical processes, so called because the energy necessary to cause them to take place is supplied in the form of light. A well-known instance of this group is the production of a photographic negative, in which the silver compounds in the emulsion with which the plate or film is coated are not acted on by the developer until they have been exposed

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to light, and have taken up energy therefrom. When activated by this means they are converted by the developer into metallic silver which is the explanation of the darkened portions in the negative.

With the knowledge that has been gained by the study of these reactions, it is not difficult to realise that, in some way or another, the light of the sun must be the source of the energy which promotes the formation of the complex carbo-

hydrates and proteins from the carbonic acid in the leaves of the living plants. The problem has proved a difficult one to solve, however. Many experiments have been made, in which carbonic acid in solution in water was exposed to light, with results which seemed to be extremely disappointing. The only product detected was formaldehyde, or formalin, and this certainly is not formed as such in the plant.

In addition to this, it can be demonstrated from the general theory that the only light capable of acting on carbonic acid is that which lies in the extreme ultra-violet region of the spectrum, whereas the synthesis of carbohydrates in the living leaf is caused by visible light alone.

Recently, the key to the puzzle has been found in the necessity for a surface to be present on which the process can take place,



A STREET IN SLUMLAND

[Newton & Co.]

Overcrowding in our large cities means lack of sunlight and fresh air for the inhabitants—and consequent ill health.

and the only criterion of the surface is that it must have the power of collecting or absorbing the carbonic acid on itself. Such a surface is given by the finely divided carbonates of aluminium, magnesium, etc., which are suspended in pure water through which a stream of carbonic acid gas is passed.

When ultra-violet light falls on the surface which contains on it a layer of carbonic acid, there are formed compounds

which are very complex and are similar to those naturally produced in the living leaf. These may be recovered from the solution after the separation of the powder and examined. That was the first step forward, and the second and more important step was gained when it was found that, if a coloured surface be used, such as green nickel carbonate or rose-coloured cobalt carbonate, the same complex products are obtained when visible light is used. In the natural leaves the photosynthesis takes place on a surface, and it would seem that the natural process has been realised in the laboratory. Not only have the naturally occurring compounds been formed directly from carbonic acid by the action of light, but they have been produced by means of visible light, as they are in the living leaf.

It is believed that the great difference between the chemistry of the living plant

SUNLIGHT AND HEALTH

and the chemistry of the test tube, flask, and beaker is that the former is essentially a chemistry of very high energy, and the whole system is raised to an energy level that is unknown in non-vital processes.

It is also maintained that the chemistry of living animals is of the same type, namely, chemistry of high energy. This

Energy in Fresh Foods. deduction is greatly strengthened when we realise the great benefit to man and beast of eating vegetable foods in a fresh state, when their high energy content has not suffered by their being kept too long. If these assertions are correct, then we see at once that science is able to offer advice which is of real value as regards the health of mankind.

This advice deals with the importance of maintaining unimpaired the high energy level characteristic of good health.

Man obtains his energy from his food, and helps to maintain it by means of light. The food, and, in particular, the vegetables he eats, should be as fresh as possible. Plenty of light is of paramount importance to good health, more particularly for young children, who not only have to make good the normal wastage, but have also to build up fresh material.

Let us see to it that, in addition to fresh food, there is plenty of window space in the schools and the homes that are being built. In place of ordinary glass one of the modern materials should be used which are more transparent to the health-giving light rays. The superiority of, at any rate, one of these has already been demonstrated by practical experience. Herein lies the bounden duty of all those who have at heart the good health of our people, both young and old.



[Courtesy]

A MODERN SUNSHINE HOME

["Vita" Glass]

Plenty of windows, fitted with "Vita" glass, admit health-bringing ultra-violet rays to all the rooms.

THE EFFECTS OF SUNLIGHT

By **PERCY HALL, M.R.C.S., L.R.C.P., Hon. Actino-Therapist, Mount Vernon Hospital.**

OF the waves of radiant energy sent out by the sun, a proportion only reaches the earth's surface. Ultra-violet waves, for instance, possess almost no penetrative power, and are filtered out by the clouds, dust and dirt, water vapour and smoke, in the atmosphere. The infra-red or heat rays, on the other hand, are capable of penetration, and can pass unaltered through smoke and dust particles. They are absorbed by dark clothing and water vapour, and re-radiated as heat.

Consequently, the composition of sunlight as it reaches the earth varies enormously with local conditions. The curative value of sunlight is due to the combined effects of luminous ultra-violet and heat rays in the correct proportions. Heat rays in excess are actually harmful, and will counter-balance and nullify the good effects obtained from ultra-violet rays if injudicious exposure to them is made. For this reason, heliotherapy, or exposure to natural sunlight, is best practised in the early morning or late afternoon, when the solar radiations are rich in ultra-violet content, but relatively poor in heat rays. In the middle of the day, heat rays preponderate, and actual harm may be caused if injudicious exposure of the body to the sun is made without adequate protection to the head and neck.

In the tropics, particularly in the plains of India, where the moisture in the air assists in filtering out the ultra-violet rays, heat rays are again in excess, particularly at midday—which fact partially explains the harmful effects of the tropical sun. Nevertheless, a certain proportion of heat rays assists the absorption of ultra-violet rays into the blood stream, since the surface of the body is warmed and flushed with blood.

Though ultra-violet rays have but little power of penetration, they are absorbed by the blood circulating in the tiny blood-vessels of the skin, and produce profound

changes in the living chemistry of the body, the effects of which are carried into the general circulation of the blood, and distributed throughout the body.

The blood-colouring matter—haemoglobin—can be increased in amount by the action of these rays. Calcium, phosphorus, iron, and iodine are present in minute amounts in the blood of normal, healthy people, being conveyed to the tissue cells for their nutrition and repair, and all these can be increased in amount by suitable irradiation. Many depressed states of health are due to a lack of these mineral salts, and much can be done to hasten cure by restoring the natural balance in the tissues.

Ultra-violet rays also influence the central nervous system which, by means of its peripheral nerve supply, governs all the organs of the body. The nerve-endings in the skin are stimulated by suitable doses of light, and send impulses to the brain, which are referred back to various parts of the organism. The metabolic functions of the body are stimulated, whereby the chemical processes of building up the tissues of the body, and excreting waste products, are improved. It will therefore be seen that sunlight, when rich in the active ultra-violet rays, exerts a profound effect not only upon the skin at the site of irradiation, but upon the bodily functions as a whole.

A bright sunny day exerts a definite stimulating effect upon our spirits, whereas dull, sunless days are depressing. After a series of sunless months, the health of the community suffers, and sickness is prevalent. This is in part due to the lack of the stimulating effect of sunlight upon our minds, and partly to the absence of the bactericidal power of the solar rays, whereby bacteria in the air are enabled to multiply. Tubercle bacilli are speedily destroyed when exposed to sunlight, and similarly other harmful organisms lose their power of causing disease under the influence of the sun's rays.

Sunlight has a powerful effect, not only upon human beings, but also on animal and plant life.

Ultra-Violet Rays.

SUNLIGHT AND HEALTH



REVELLING IN THE SUN CURE

[Keystone

Animal and Plant Life. The green colouring matter of plants—chlorophyll—is very similar in chemical composition to the red colouring matter of the blood—haemoglobin—which, as has already been stated, is increased in amount by suitable exposure to sunlight, whether natural or artificial. Photochemical changes are produced in the plant by the action of light, and particularly of ultra-violet light, whereby the plant is enabled to build up its chlorophyll, and to synthesise its starches from the carbon dioxide in the air and the salts derived from the soil. On the other hand, heat rays in excess destroy the chlorophyll, and the plant suffers in consequence. This phenomenon is familiarly observed in hot, dry summers, when grass loses its green colour and becomes withered and yellow. This effect is partly due to the excessive heat from the sun's rays.

During the last few years much attention has been focused upon the necessity of a sufficiency of so-called "vitamins" in our food. We are still in doubt as to the exact nature of vitamins, but what we do know is that they are accessory food factors of the greatest possible importance. A lack of one or other of the vitamins in food will lead to the production of certain diseases, whereas when the diet is supplemented by some substance known to contain the lacking vitamins, recovery takes place.

Vitamins are present in great amount in green vegetables, certain grains, and in various fruits, and they owe their presence there largely to the action of the ultra-violet rays of the sun. Vitamin D has been experimentally produced in substances which previously did not contain it, by exposure to ultra-violet radiations.

When natural sunlight is absent, or is

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deficient in the beneficial ultra-violet rays, vegetation suffers, and consequently its food value is diminished. Thus both human beings and animals are indirectly affected by a deficiency of sunlight, through the food ingested. *

Animals kept in dark sheds, or after a succession of sunless months, become unhealthy. Cows kept in dark, ill-lit, and ill-ventilated sheds are more prone to tuberculous infection than are those who obtain an adequate amount of sunlight, and there is no doubt that the tuberculosis of childhood—and possibly also of adults—is in a great measure due to the tuberculous infection from an impure milk supply. The milk of cows fed on open pastures is rich in vitamin content, whilst the milk of cows fed in stalls on oil-cake has little or no vitamin content.

The smoke from factory and domestic chimneys, particularly in the manufacturing areas, adversely affects not only the inhabitants but the vegetation for miles around by screening the sunlight. The domestic chimney is the worst offender of all, and plays a

Atmo-
spheric
Smoke
Pollution.

great part in the pollution of the atmosphere. In Germany and the United States of America, the smoke nuisance has been to a great extent overcome, but in Great Britain little has, as yet, been done to control it.

THE INFLUENCE OF THE MOON

By Professor E. C. C. BALY, C.B.E., M.Sc., F.R.S., Grant Professor of Inorganic Chemistry at the University of Liverpool.

THE light from the moon and its influence on life presents a subject of fascinating interest. As no doubt most people are aware, there exist in folk-lore numbers of beliefs in the special properties of moonlight, which can exert both a bad and a good influence on life. On the one hand, we have the very old tradition that moonlight is extremely bad for insane persons, and that their fits of dementia are connected with the light from the moon; indeed, this tradition is perpetuated in the very name "lunatic." On the other hand, there is a widespread belief amongst the country folk, not only in Great Britain but in America



NATURE'S PRESCRIPTION

[Photopress

Little patients, suffering from rickets and tuberculosis, under Dr. Sun's care at Alton, Hampshire.

SUNLIGHT AND HEALTH



[Newman, Berkhamsted.]

GOOD MILK IN THE MAKING

The sunlight and fresh air of open pastures promote a milk free from tuberculosis and rich in vitamins.

and elsewhere, that the seeds of plants which grow upwards, as distinct from root crops, should be planted in the light of the moon.

During the last few years some observations have been made which appear to offer a truly scientific explanation of all these old beliefs in the power of moonlight.

Miss Semmens, a lecturer in the Horticultural College at Swanley, interested in a report that cucumbers grew better if exposed to moonlight than when covered at night, undertook some experiments of her own. She planted the same number of seeds of asters in three boxes, and these boxes were exposed to sunlight alone, moonlight alone, and to sunlight and moonlight, respectively. The germination of the seeds in the last case was materially more rapid than in the other two cases, and the young plants appeared to be stronger and more healthy. This result gave clear evidence of the specific effect of moonlight, and it is interesting to note that the effect apparently disappeared once the little plants were well established.

Work
of Miss
Semmens.

In spite of this, however, the observations were continued, and it was then found that the selective action of moonlight evidenced itself once again just before the flowering stage, only to disappear once more when the flowers were fully developed. Miss Semmens interpreted these results on the assumption that the reserve food materials laid down in the seeds and stored up in readiness for the formation of the flowers are resolved into simpler substances by the action of the moonlight, this resolution, or hydrolysis, as it is called, being a process well recognised by botanists.

Miss Semmens asked herself why moonlight is able to hydrolyse the starch and proteins and other food materials of the plant. It occurred to her that it might be due to the fact that the light from the moon is polarised to a certain extent.

She therefore investigated the action of polarised light on crushed mustard and other seeds moistened with water, control experiments being carried out in which the same materials were exposed to ordinary

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light. She then found undoubted evidence of hydrolysis taking place in the polarised light and not in the ordinary light.

Miss Semmens then carried out a rigidly controlled investigation on the action of polarised light on one single substance, which is a very characteristic reserve food material of plants, namely, starch. Her results were quite convincing. The starch was hydrolysed to sugars which form the real plant food.

During the daytime, under the influence of sunlight, the living plant forms in its leaves amongst other things starch, and this can be recognised under the microscope. During the period between just before sunset and just after sunrise, this starch disappears, being used up by the leaf for its benefit. Why does this starch vanish? It is well known that the light from the evening and morning sky is strongly polarised, and hence we at once find an answer to this question.

These and further experiments thus give convincing evidence to show that the living plants depend for their livelihood both on sunlight and on moonlight. By the one starch is built up from the simplest possible beginnings, and by the other the starch is resolved into simpler substances, which form the actual food of the plant.

One of the many beliefs prevalent in the tropics is that trees should never be cut down in the light of the moon, since, if so, the trunks become ruined by the growth of worms. Can we not recognise that this belief is founded on a scientific fact, and that the moonlight falling on the leaves of the freshly hewn tree breaks down the starch therein to sugars on which the worms can live?

If we turn to man and other animals whose vital processes do not depend entirely on light, then we find a different type of legend, namely, the harmful influence of moonlight. This is not surprising, and, indeed, is to be expected, since the changes induced must be different from the normal, and hence must be more or less harmful.

There is the well-known bad effect on the eyes and face of the polarised light scattered from the Alpine snowfields, and as a complement to this may be mentioned the complaint known to sailors as tropical moon blindness—a complaint that is entirely due to the polarised light of the moon.

Recently there has been an appeal from the monks of the Hospice of St. Bernard on behalf of the noble breed of "Snow Blindness," dogs, the story of whose achievements in bringing succour and rescue to the weary traveller in that wild and storm-swept country will never die. Exposed as they ever are to the light from the eternal snows, these dogs have long been prone to blindness, and as time has passed they have become more and more susceptible thereto, until now one learns that the puppies are of necessity the progeny of blind parents. Indeed, we are told that unless this deterioration is stayed, this noble breed is doomed.

There is no doubt that the explanation of the trouble is to be found in the polarised ultra-violet light from the snow. This light sets up abnormal chemical processes within the delicate mechanism of the eye, and if there be no protection against it, these changes finally end in blindness.

Can we any longer find it possible to deny that there may be some truth in the well-known legend, that it is bad for little children to sleep in the direct rays from the moon? We know now that moonlight can cause a chemical change which is foreign to the normal processes of man, and so it may well be that such would be harmful to a growing child.

In the same way it would be very rash to state categorically that the old belief in the harmful effect of moonlight on the insane is entirely and utterly absurd.

Let us now consider the whole story and envisage it in all its bearings. In the case of living plants the sunlight causes the formation of those complex compounds known as starches and proteins, many of which form the reserve food supply of the

SUNLIGHT AND HEALTH



A SUMMER VIEW OF THE HOSPICE ST. BERNARD

(D. McLeish)

• “Snow blindness”—caused by ultra-violet light reflected from the snow—is a difficult problem with the noble breed of rescue dogs kept by the monks. •

plant. In the state in which they are so formed they apparently cannot be used by the plant, and so they are stored up in readiness. In the evening, and in the rays of the moon, the polarised light causes the resolution of these hoarded food supplies into a form that can be used by the plant, and so it grows fat and waxes strong. The starch is resolved to simpler compounds which are absorbed and digested; the leaves then no longer breathe out oxygen, which is characteristic of the day life of plants; they now exhale carbonic acid gas, and this alone is evidence of the essential change that supervenes when the polarised light of the evening sky and the moon exercises its beneficent influence.

When we come to man and the other animals, the case is entirely different, for these do not depend on light for their food. This they obtain ready-made for them, the initial production of this food supply taking place entirely in the plants. Since, on the one hand, this polarised light is not required, and, since, on the other hand, this light has an action on the substances present in the animal kingdom, which are entirely analogous to those in the plants, it follows that this action of polarised light on man and animals must be deleterious.

We thus obtain a picture, the component parts of which fit together in a remarkable manner.



[Photopress]

THE SUNLIGHT CURE

By PERCY HALL, M.R.C.S., L.R.C.P., Hon. Actino-Therapeutist, Mount Vernon Hospital.

THE-HYGIENE OF SUNLIGHT

THE importance of sunlight cannot be overestimated since it plays such a large part in the maintenance of health, vitality, and well-being in all but fungous forms of life on this planet. As a method of curing disease its scope is wide, but as a preventive it is even more far-reaching.

Industrialism is to a large extent responsible for the deterioration in physique which was brought home to us by the late war, when it was realised that a large proportion of the manhood of the nation came into the C 3 category. Many factors contribute to this deterioration, such as overcrowding of the population in urban districts, with improper housing and inadequate ventilation; sedentary occupations involving long hours in stuffy rooms, often with artificial lighting; atmospheric smoke pollution; and the almost universal custom of spending both working and leisure hours indoors.

During the last few years, daily readings have been taken of the ultra-violet content of the sunlight which reaches us in London and certain other of the larger cities. This amount is shown to be so small, at least during the winter months, as to be negligible. Artificial sources of ultra-violet rays have

been installed by the authorities at the Zoological Gardens in London, and have produced a marked improvement in the health of certain of the animals.

Another important factor affecting the health of the community is diet. Owing to over-population in these islands, we are unable to raise sufficient food for our needs, and consequently the greater part of our food supply is imported, often from vast distances.

This food reaches us in various states of devitalisation, owing to the necessity for preserving it by freezing, "canning," and other methods. Although actual decomposition of the food is thereby avoided, it cannot and does not retain all the valuable properties of fresh food, either animal or vegetable.

The vitamin content of the food, for instance, may readily be destroyed by such means of preservation. It is generally admitted by dieticians and physiologists that we are, as a nation, vitamin starved. It has already been shown that vitamins owe their presence in foodstuffs to the action of sunlight, therefore to be vitamin starved means to be starved of sunlight. So long as these vital accessory food factors are present, perfect health and vitality can be maintained on a very small total quantity of food.

SUNLIGHT AND HEALTH

Cod liver oil has been used for many years in the treatment of rickets, and diseases of malnutrition, and in tuberculosis. Recently, its value

Cod Liver Oil. in these directions has been shown to lie in its vitamin content. Yet the cod spends much of its life in the dark waters of the Northern Hemisphere, where but little sunlight penetrates. Its liver stores up vitamins to enable it to live through the dark winter months by drawing upon this reserve. These vitamins are obtained from its diet, which consists of the smaller fish, which have again fed upon minute green vegetable organisms called plankton. These organisms absorb the ultra-violet rays from the sun during the brief but brilliant summers which prevail in the Arctic regions, and furnish the vitamins for the smaller fry, which in their turn supply the larger fish, including the cod.

Similarly, human beings can maintain

health and vigour on a small dietary, so long as the essential constituents are present. In the preparation of wholemeal flour fewer vitamins are lost than in the case of white flour. In grain, Nature has stored vitalising substances destined for the especial needs of the embryo plant. These are to a great extent removed in the preparation of white flour, thus depriving us of the essential vitamins, and also beneficial elements such as phosphorus, magnesium, and silica.

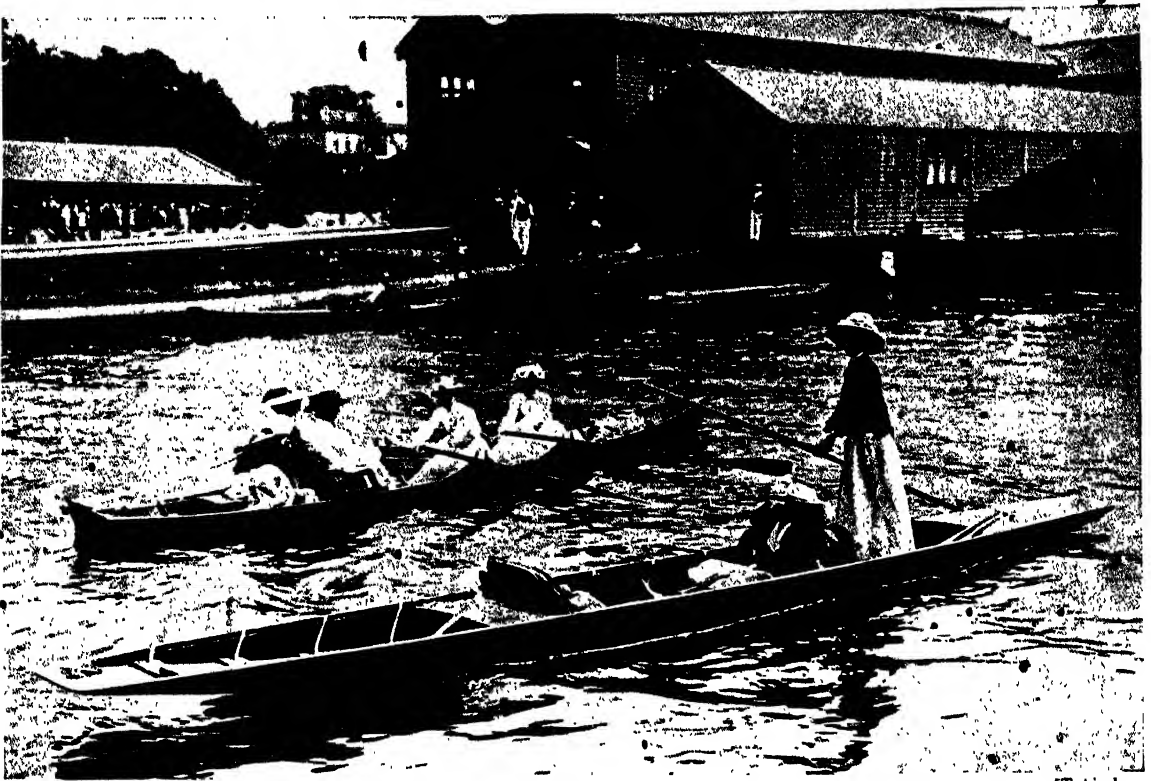
Clothing also plays an important part in maintaining or lowering our vitality, as light is essential to the needs of our bodies. Overclothing is harmful, since it prevents the access of both air and light. This is well shown by comparing the modern woman with her predecessors of the last generation. It is generally acknowledged that woman to-day is healthier, more vigorous both mentally and physically, and far younger for her



TEN DEGREES BELOW ZERO

Sunbathing is combined with the athletic training for women teachers of gymnastics in Germany.

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TWENTY YEARS AGO

[Topical

A striking example of the cumbersome and unhealthy clothing which handicapped the woman of the last generation.

years than were the women of the earlier generations. This improvement in physique and vitality can be directly traced to the emancipation of women in regard to their clothing, and to their more active outdoor life.

Modern dress is adapted to allow freedom to the limbs, the neck and often the arms being bare, thus permitting of the free access of air and light. Silk or its artificial substitutes are largely used in clothing of all descriptions nowadays, and artificial silk has been found to be remarkably transparent to ultra-violet rays. Wool and thick cloths, on the other hand, are opaque to these rays. A generation ago, women wore voluminous undergarments and skirts which trailed upon the ground, close-fitting collars and long sleeves, and spent the greater part of their lives indoors at sedentary occupations. Their garments were not only more in bulk, but were made of thicker and heavier material. The result was that the woman of forty was then considered an old woman,

and was certainly incapable of either mental or physical exertion to any great extent. Her modern prototype at forty is a "young" woman, who is vigorous in both mind and body, and capable of outdoor exercises in the fresh air during the day, followed by dancing at night, without undue fatigue. This striking alteration is largely due to the beneficial effects of fresh air and sunlight, which are permitted to have free access by the modern hygienic mode of dress, which includes short skirts and thin silken hose.

To maintain perfect health we must pay attention to the proper irradiation of both our food and our bodies.

Overcrowding is responsible for much ill health and actual disease. Children living in slum areas are generally sickly, ill-nourished, and prone to disorders such as rickets and anaemia, both of which are readily amenable to ultra-violet radiations. It is both easier and better to prevent rickets than to cure it.

SUNLIGHT AND HEALTH



[Graphic Photo Union]

THE MODERN WAY

The present-day desire for dress, admitting free access of sunlight and air to the skin, is a healthy witness to woman's new freedom and vigour.

Prof. Huldschinsky, of Berlin, has been so impressed by the preventive action of light that he stated that, in his considered opinion, every infant shortly after birth should be given a few doses of artificial sunlight as a protection against rickets. If this were done, he considers that rickets as a disease would speedily be stamped out.

It has been proved that certain sensitive substances, if suitably irradiated, acquire the property of preventing rickets, although they were previously inactive. This has been found to be due to the production of the "anti-rachitic factor"—Vitamin D, which enables the body to utilise aright the mineral salts used in the making of bones and teeth.

There is enormous scope for the development of such irradiated substances, for either human or animal consumption. Much might also be done by altering the present modes of preservation of foodstuffs. Biltong and

Irradiated
Foodstuffs.

pemmican are both sun-dried articles of diet, and are found by travellers to be of the greatest nutritive value. When climatic conditions permit, it should certainly be possible to utilise this natural mode—sunlight—to a greater extent than has been done in the past, with great improvement in the value of the foodstuffs so preserved over the present commonly employed methods.

HELIO THERAPY

Heliotherapy, or treatment by natural sunlight, has been found to be of the greatest value in the treatment of a variety of diseases. Diseases such as tuberculosis and rickets flourish when sunlight is deficient, as in slums and overcrowded manufacturing districts, and these diseases are readily amenable to treatment when the deficiency of sunlight is remedied.

On the Continent, most valuable work has been done by various workers, notably

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Dr. Rollier, at Leysin, and Dr. Bernhard, at St. Moritz. These workers have obtained excellent results in the treatment of certain surgical conditions, and in tuberculosis involving bones, joints, glands, and peritoneum, by means of carefully graduated exposures to natural sunlight. Dr. Rollier established, in 1910, his "School in the Sun" at Cergnat, in the Vaudois Alps, where normal, as well as sickly, children are not only treated by suitable exercises and exposure to sunlight, but are also taught lessons, almost nude, in direct sunlight in the open air. Ailing children not only recover from their original physical disability, but have been found to attain greater mental alertness and development than normal children of the same age who are working under the usual conditions indoors.

To obtain sunlight at its best, many factors are required. The "Sun Cure" should be practised where the sky is blue and free from clouds, the atmosphere clear and containing little dust or water vapour. Snow, sky, and water all reflect ultra-violet rays, therefore good results can be obtained in places such as the Alps, or at the seaside, if other conditions are favourable.

In this country the sun is a comparatively rare visitor even in the summer months; the altitude is low, and the air is charged with dust, moisture, and smoke, all of which combine to minimise the benefits of the solar rays. Consequently the natural "Sun Cure" can only be practised outside our present cities, and at certain times of the year. Sir Henry Gauvain has obtained excellent results at the Treloar Hospital in Alton and at Hayling Island by treating tuberculosis by natural sunlight, but he finds it necessary to supplement the natural treatment from artificial sources of ultra-violet rays throughout a considerable portion of the year.

Most of the beneficial effects of the solar rays are due to their ultra-violet content, but a small part is due to the infra-red radiations. These latter rays owe their good effects to radiant heat, but when the atmosphere

through which they pass is clouded with dust or moisture, they are absorbed and heat the air. This in turn parts with its heat, but by a process of conduction and convection, and the effects produced by the latter means are fatiguing and not enervating. In a similar way, the earth absorbs heat, and parts with it once more. In the High Alps, however, these infra-red rays are absorbed by the snow on the ground, which does not part with the heat formed, and as the atmosphere is clear and dry, the beneficial ultra-violet and infra-red rays can reach the patient direct without obstruction or alteration. The climate of the High Alps is therefore ideal, and sun-bathing can be judiciously practised during the greater part of the year with benefit. Patients who are wearing only linen cloth, boots, and a linen hat, can enjoy insolation, and feel invigorated and warm even when the temperature is low, and thick snow covers the ground. Like snow, water absorbs heat rays and reflects ultra-violet, and thus our long seacoast, especially in the south, is well adapted for heliotherapy.

Infra-red rays in excess minimise the effects of ultra-violet, and therefore exposure to natural sunlight should be made when the ultra-violet content is at its maximum, that is, in the morning and late afternoon, and not when the heat rays predominate, as at midday. When disease is being treated by means of heliotherapy, the exposures are graduated with care. At first the patient may expose only the feet and hands for a short period, then the legs and arms, and so on, gradually increasing both the area of exposure and the duration as tolerance is established. Finally the whole body may be exposed for long periods daily.

In treating tuberculosis, particularly of the pulmonary variety, the greatest skill and judgment are required in estimating the duration and amount of exposures. Injudicious exposure of the whole body is to be rigorously avoided, as harm will be done, and the disease aggravated rather than benefited.

Harmful Exposure.

SUNLIGHT AND HEALTH



THE SUN CURE

[Keystone

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The head and neck must always be protected from the heat of the sun, and the eyes shielded if necessary from the ultra-violet rays.

ACTINOTHERAPY

The pioneer in actinotherapy, or treatment from artificial sources of ultra-violet or actinic rays, was Niels Finsen, of Copenhagen. He commenced treating lupus by

directly upon the affected tissue, but upon the body as a whole, by raising the general resistance to the invading organism, and the modern method of natural heliotherapy, as practised by Dr. Rollier and others, includes exposures of the whole body to the sun.

In Denmark, during the greater part of the year, the climate is but little sunnier than that of Britain. Finsen, therefore,



Courtesy]

[South African Railways

STORING UP SUNLIGHT

Fruit preserved by sun-drying is rich in vitamins. This photograph was taken on a South African fruit farm.

means of natural sunlight in 1893, and came to the conclusion that the good results obtained were due to the ultra-violet content of the solar spectrum. He believed that the effect of these rays was directly bactericidal, that is to say, that they destroyed only those bacteria which were directly exposed to these rays. He therefore treated only the affected parts, and not the body as a whole. Further research has shown that the ultra-violet rays do not only act

evolved a lamp for the artificial production of actinic rays. This type of lamp—the “Finsen Light”—was installed in the London Hospital over twenty years ago, largely owing to the efforts of H.M. the late Queen Alexandra, who took a keen interest in the work of her fellow-countryman.

The results obtained by this method of treating lupus were considerably better than those from any previous mode of treatment, but, notwithstanding, little interest was

SUNLIGHT AND HEALTH



[G. Decaux, Leysin.]

THE WORK CURE

Convalescents enjoy a spell at haymaking at Leysin, Switzerland.

taken in Finsen's work by the majority of the medical profession both here and abroad, and practically no further progress was made for many years.

It is only recently that the value of artificial sources of ultra-violet light in the treatment of general constitutional disease has been realised.

The original "Finsen Lamp" has been almost completely superseded, as it was found to be cumbersome, expensive to maintain, and slow in its results, and more modern lamps have been devised. It was found that many other skin diseases besides lupus were amenable to ultra-violet rays, and that cure was hastened when general exposures of the trunk were given additionally to the local treatment, and this technique is now almost universally adopted.

Many varied forms of lamp are now manufactured. These differ in detail, but all fall into three main categories, namely: 1. Carbon arc lamps; 2. tungsten arc lamps; 3. quartz mer-

cury vapour lamps. In the two former, the arc is struck between electrodes of carbon or tungsten respectively, and the ultra-violet rays produced are given off directly into the atmosphere. In the latter type, the arc is struck between two columns of mercury in an enclosed tube of quartz. Quartz is chosen because it permits of the passage of ultra-violet rays, which are filtered out by ordinary glass. Ultra-violet

rays are given off by the incandescent mercury vapour, and pass through the quartz on to the patient.

These three main types of lamp emit different groups of wave-lengths, and consequently the effects they produce vary. Generally speaking, the carbon arc lamp, when pure carbon electrodes are used, emits a larger proportion of heat rays and a smaller proportion of ultra-violet than do either of the other two types. These lamps consume a large amount of current, and are best suited for hospital or institutional work, where the patients can be treated in groups simultaneously.



GYMNASTICS IN THE SUN.

A view of Dr. Rollier's sun clinic and school at Leysin.

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SUN-WORSHIPPERS

Strong bodies moulded by the sculptor sun.

[C. Brandt, Arosi]

TREATMENT OF DISEASE

It has already been shown that exposures to ultra-violet rays exert profound effects, which influence, through the nervous system, all the organs of the body. It is therefore rational to expect that this mode of treatment will benefit many and varied groups of disorders, and this is found to be the case.

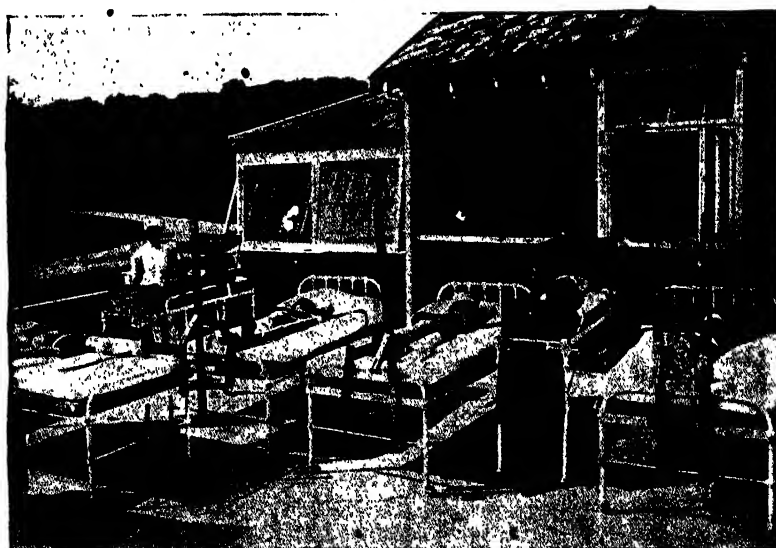
Ultra-violet rays produce effects upon the skin through its blood-vessels, and innumerable

The spectrum of burning tungsten is the richest in ultra-violet output of any metal known, and the tungsten arc lamp is therefore a very powerful source, and must be used with discretion. The quartz mercury vapour lamp is also rich in ultra-violet output, but of different combinations of wave-lengths.

The precise details of these lamps, their particular uses and their administration, are matters for the expert, who should be fully qualified not only by a medical training, but also by experience in this particular branch of therapy. Ultra-violet rays are a potent agent, powerful for evil as well as good. If used with judgment, by fully qualified men and women versed in the method, excellent results can be obtained. But the reverse can also occur from careless administration by those who have not the medical training necessary to detect danger signals as they arise. This treatment should never be left in the hands of the unqualified.

tiny nerve-endings, and when doses are sufficiently strong to cause blistering, actual destruction of the superficial layers of the skin may be produced. It is therefore valuable in a variety of skin disorders, particularly of the inflammatory type, such as boils, acne, impetigo contagiosa, chronic ulcerations, and in tuberculous infections such as tuberculides and lupus. In patchy baldness its results are excellent.

Ultra-violet rays are absorbed into the



ON THE WAY TO HEALTH

A corner of one of the ten "solaria" at Alton, Hampshire.

SUNLIGHT AND HEALTH

blood stream through the blood-vessels in the skin. They derive their name, "actinic" rays, from the chemical changes which they produce. The products of these chemical changes are carried into the general circulation, and therefore influence the body as a whole. The changes produced in the blood are: an increase in its red colouring matter, and in the essential salts, such as calcium, phosphorus, iron, and iodine; the production of the "anti-rachitic factor," now known as vitamin D, and an increase in the bactericidal power of the blood, which enables it more readily to overcome bacteria and their poisons circulating in the blood stream.

Owing to these properties, ultra-violet rays are useful in raising the general resistance to any infection, or, in suitable amounts, in overcoming an infection when present. Too large doses, however, have the reverse effect, and lower the resistance, which again emphasises the importance of correct administration by experts.

Calcium is deficient in various states of debility, generally referred to as "pre-tuberculous" states, and also in tuberculosis, particularly in children with enlarged glands in the neck, chest, or abdomen, as also with tuberculous joints. It is also a factor in

the production of chilblains, which can often be cured by one or two suitable exposures.

Haemoglobin is deficient in certain of the anaemias, and also in rickets, where a combined calcium and phosphorus deficiency exists additionally. In simple enlargements of the thyroid gland, iodine is often given with benefit, and similarly ultra-violet rays

—by increasing the iodine in the blood—may assist in the disappearance of the goitre. Iodine is also beneficial in rheumatic disorders, which are often readily amenable to actinotherapy.

Respiratory disorders, whether of the catarrhal, bronchitic, or asthmatic type, often yield to this form of treatment; in fact, the most inveterate and old-standing cases of asthma may improve after correct irradiation, when other methods have been un-

availing. Urticaria and hay fever—two disorders closely allied to asthma—can also be benefited.

Metabolic disorders, including gout, and conditions such as high blood-pressure, may be included as amenable to actinotherapy.

Although ultra-violet radiation is of such great value as a general tonic, and useful in so many conditions, it must not be regarded as a panacea. In many cases the



AN ARTIFICIAL SUN-BEACH

Children receiving ultra-violet ray treatment in the new
Institute of Actinology in Paris.

Topical

THE GOLDEN HEALTH LIBRARY

best results can only be achieved by the coincident use of other medical methods,

either drugs or physical agents, with actinotherapy. This can only be done by skilled administrators, who are fully qualified in medicine and also in this branch of therapy.

The results obtained in treating infants and children suffering from rickets and malnutrition, by ultra-violet rays, have been so striking that numbers of clinics have been started up and down the country.

Many people, having heard of the undoubted value of ultra-violet radiation, have installed lamps in their own homes, for self-administration. Such lamps may be of value, provided that they are but weak sources of ultra-violet, and that care is taken in their use. Unfortunately, few of the models now on the market fulfil these requirements. For mild states of debility,

and for producing a tonic effect, such lamps may be useful, but it should be remembered that over-stimulation leads to depression, and that excess in all things is harmful.

It cannot be over-emphasised that under no circumstances whatever should lay people instal lamps in their own homes for the treatment of definite disease. This should always be left in the hands of competent and fully qualified people. The Minister of Health has already found it necessary to warn the public of the dangers of actinotherapy, whilst admitting its undoubted value under the direction of experts.

The use of sunlight in the treatment and cure of disease is surely ushering in a new era in medicine when the natural agencies of air, light, water, electricity, food, and exercise will be used as remedies, rather than drugs. Nature—not the doctor—cures disease, and heliotherapy is a perfect example of a natural cure.



“ THE COOK-HOUSE DOOR ”

[Keystone]

Boy scouts bringing healthy appetites to breakfast.

SUNLIGHT AND HEALTH



[L.N.A.]

SUNLIGHT IN THE HOME

SUNLIGHT AND HAPPINESS

By **ELIZABETH SLOAN CHESSER, M.D.,**
*Ch.B., Lecturer and Examiner to the L.C.C. and
the British Red Cross Society.*

WOMEN occupy a very important place in the new educational campaign for health and happiness. They have the care of human beings during the earliest and most impressionable years of life. They are the home makers, and they have it in their power to give or to withhold from the families of the nation, sunlight, fresh air, and perfect food.

Sunlight is the source of all life and beauty. From the sun we derive our energy, our thoughts and feelings, our life force. Deprived of sunlight, children grow delicate and colourless like plants in the dark, and light, when properly administered, can confer health and beauty and contentment upon the sick and unhappy. I have seen children at Leysin in Switzerland, symmetrical and beautiful like bronze statues, who had been sent helpless and hopeless from different parts of the world for the

cure in the sun. I have seen the little mothers of Japan sun-bathing their babies by the beautiful Inland Sea, and sun cures in process all over the world from America and Canada to Budapest, where families spend the day in the lovely Margaret Lake, storing health and energy for the winter. And always I think that doctors and scientists will achieve their new ideals of a more perfect and happy race through the mothers and teachers and nurses.

Teach women that tuberculosis, the great white plague, can be cured by sunlight, because light destroys the germs of disease. Teach them that rickets, that terrible scourge of little children, that disease also which is responsible for many women's deaths in childhood, is curable, again by sunlight. "Light is the queen of colours," said St. Augustine, and women ought to know what light is.

What can women do to further their knowledge and to raise the health standard of the nation? 1. Let sunlight enter the home; fewer curtains would give fewer germs. Any curtains which in the slightest



[Courtesy]

SUN-BATHING IN HUNGARY

[Royal Hungarian Legation]

Storing health and energy for the winter on the shores of the Margaret Lake at Budapest.

degree cover window panes must be light and transparent, like net, and other curtains should be pulled back from the windows against the wall space. 2. Windows should be open, as glass cuts off the ultra-violet rays. 3. All new houses should be supplied with the new glass which allows ultra-violet rays to penetrate. 4. Meals should be taken out of doors whenever that plan is possible. 5. Daily sun-baths should become part of the daily life.

The children will benefit the most, but we must be careful, in the case of babies especially, to increase the dose of sunlight gradually. Dr. Rollier of Leysin told me that two minutes' sun to the feet is sufficient for the first sun-bath, then gradually the legs, arms, and body are exposed until a person can have three hours early morning

sun with benefit. In England the sun's rays are less powerful, but we must avoid the hot midday sun and give sun-baths in the morning before ten o'clock in midsummer. Begin with ten or fifteen minutes and gradually increase. We must be careful to protect the eyes, head, and upper part of the spine by wide brimmed hats, and we must remember that an overdose of sun will cause restlessness, sleeplessness, and even rise of temperature. The skin should gradually pigment until it is a lovely copper colour as the pigment granules are deposited.

Let all housewives and mothers realise that sunlight is not only the best disinfectant, tonic, and stimulant—it is the greatest of all physicians; and let them see that children are not deprived of the light and air which is as important to their growth as it is to that of plant life.

SUNLIGHT AND HEALTH

SUNLIGHT AND CHILD HEALTH

By **STELLA CHURCHILL, M.R.C.S., L.R.C.P., D.P.H.,** *Medical Director of Walworth Sunlight Clinic; Author of "Health Services and the Public."*

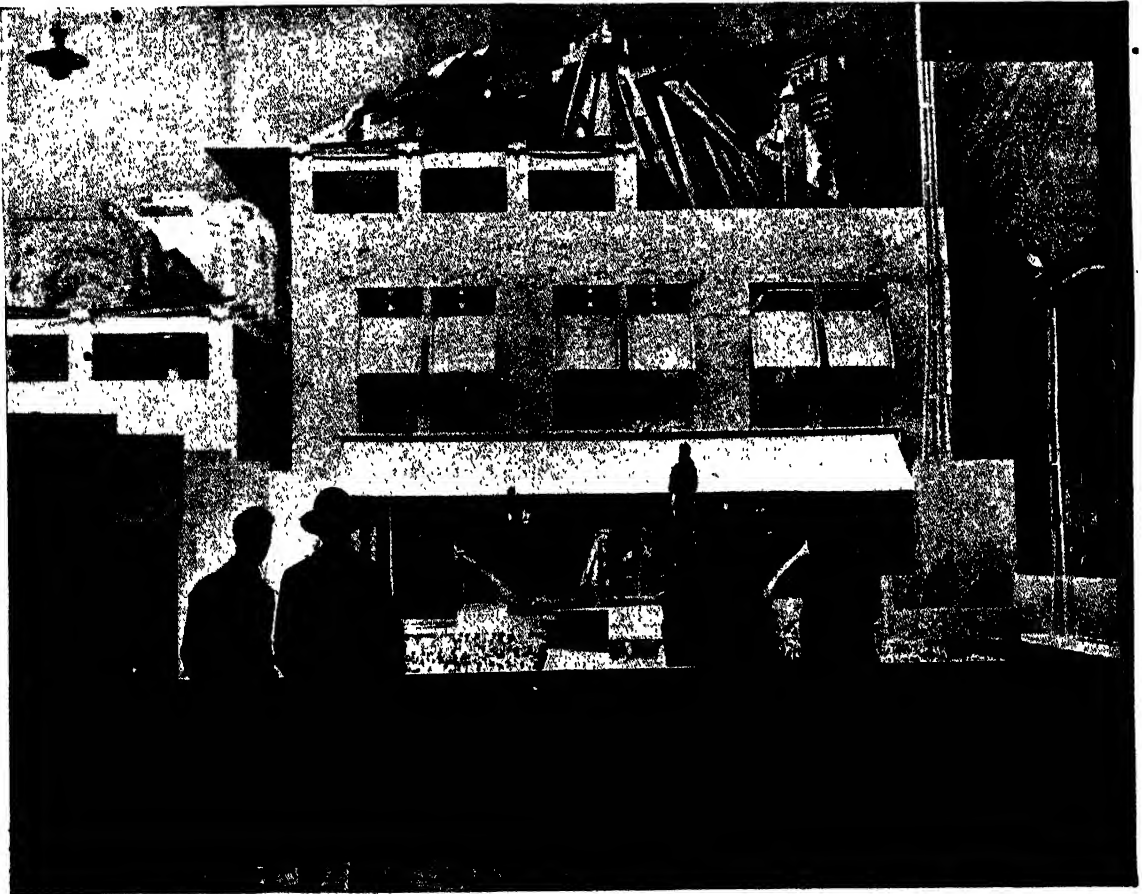
WE could not continue to exist without the sun, and although there is general recognition of the great value of sunlight in health and in preventing disease, it is astonishing to find how little provision is made for its presence in house construction.

Not more than two hours out of the twenty-four are passed by most people in the open air, and sometimes not so much during a busy week. Hence the great need for admitting the sunlight to the home, if it is to exercise any benefit on the inhabitants.

Sunlight is kept out of many homes by

means of curtains and blinds, which obstruct the passage of light and air. In crowded areas it is necessary to do this in order to ensure any privacy, and houses which are overlooked are obliged to keep their windows closed for the same reason. The fear of the fading action of the sun on carpets and furniture makes many housewives shut out these light-giving rays of the sun, with disastrous results.

In big cities, sunshine is kept from the dwellers both in houses and in the open air by a veil of smoke which cuts off most of the ultra-violet rays, and curtails all the heat and light rays. This is both harmful to health and very expensive, because children growing up in such conditions develop rickets, bronchitis, and anaemia, while big business houses have to spend a large



THE HOUSE OF THE FUTURE

[Topical

When sunlight and fresh air will be the architect's first consideration.

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TEA-TIME AT STANMORE

Dr. Sun helps to restore lost appetites.

[Alfieri]

amount of money on the artificial lighting of their premises.

Sunlight possesses three kinds of rays, which give light, that we can see; heat, that we can feel; and lastly, the ultra-violet rays, which, while they cannot be seen, burn the skin, and affect a photographic plate. Of these three kinds of rays, light and heat penetrate ordinary glass, but the ultra-violet rays come through to a less degree. Hence the interesting experiments which are still being made to find a glass which will permit the passage of these rays, for those people who are obliged to spend much time in the house: such as "Vita" glass, which is much in use.

In planning a house it is very desirable to get the maximum of sun in those rooms where the family is going to live, particularly in the bedrooms. Too often one finds bathroom and offices facing due south, the larder as well, while the bedrooms have a north aspect.

There is an Italian proverb which says, "Where the sun enters, the doctor never comes," and this is certainly borne out in the difference between the in-

cidence of rickets in countries in the South of Europe, where the children live out of doors, and in the colder cities of the North, particularly England, where for many months of the year very little sunshine is available.

The effects of sunlight on growing children are many and various, and the absence of sunlight leads to a variety of diseases and complaints. Sunlight causes a feeling of well-being and health, due to the greater rapidity with which the food is digested, and with which the general working of the body is speeded up. This is particularly true when exercise is being taken on a sunny day.

The absence of sunlight is responsible for a number of diseases, and in childhood the chief among them is rickets. This complaint, which is described elsewhere in this work, consists of a softening of the bones due to deficiencies in diet and to lack of sunlight. As a result, the child, who may be quite well in other respects, gets either bowing of the legs, or a condition of knock-knee, according to whether he is heavy or light in weight (the heavy children becoming bow-legged). A definite cure for this condi-



ON HAMPSTEAD HEATH

Children from the sunlight clinic at Kenwood.

[Alfieri]

SUNLIGHT AND HEALTH

tion is exposure to sunlight, and during the long winter months, when very little real sunlight is available, growing children should be exposed to the rays of an ultra-violet lamp, under medical supervision.

Bronchial catarrh is a very frequent source of ill health in a country like England, which is damp and cold. It can be chiefly prevented by dry, warm houses, adequate clothes, and plenty of fresh air. Unfortunately it is very common to keep children indoors for long periods of time during the winter months, with the result that they become susceptible to all changes in climate. Adults crowd together in ill-ventilated dark cinemas, theatres, and other places of amusement; are hustled and tired in tubes and trams, and they are consequently exposed to infection at a time when their resistance is lowest, namely, when they are fatigued.

To counterbalance this inevitable strain of business life, it is very important that the home should contain as much sunshine as is possible, and that all spare time should be spent out of doors. If children were taken out in all weathers from birth, they would not become so subject to bronchitis as at

present, when the death-rate from respiratory disease is higher than that from any other single cause. Here, again, during the winter, much good can be obtained by judicious use of ultra-violet rays, from an artificial source.

Other complaints, which are the result

of chronic ill health, *e.g.*, anaemia, running ears, and various septic conditions of the skin, can all be cured or prevented by exposure to sunlight. Nowhere was this beneficial result more strikingly pointed out to the public than in the daily bulletins of King George's illness, which insisted throughout on the importance of sunlight in the home, of the open window, and of fresh air.

There is no disease in which sunlight has a greater curative effect than in surgical and gland tuberculosis. This has been shown by the work of Bern-



CHILDREN OF THE SUN

(D. McLeish)

The Italians say, "Where the sun enters, the doctor never comes."

hard and Rollier in Switzerland, and by Gauvain and others in England, though exposure to sunlight in this country is always attended by difficulty owing to the nature of the climate. If sunlight acts as such a wonderful cure, we must assume that sunlight would also prevent the disease provided that the milk supply was free from tuberculosis.

THE GOLDEN HEALTH LIBRARY

Tuberculosis of the lungs is frequently found among young office workers and others who are obliged to spend long hours indoors, with few opportunities for open air recreation.

The use of sunlight in all climates needs to be carefully studied, as it can be a source of harm. Many people find when they are away at the seaside, that they become tired and irritable as a result of spending many hours on the sunny beach. The exposure to bright sunlight should always be gradual, increasing by half an hour each day, and it is most important that the eyes and back of the neck should in every case be protected. There is much more sunshine reflected on the seashore or on the mountain-tops than there is in the cities or plains.

The results of over-exposure to sunlight are irritability, with loss of sleep and sometimes fever, and a rash; whereas with the right amount of sunlight, the results are very beneficial, the child or adult eats

and sleeps well, and has a sense of "well-being." The amount that every individual can endure depends to some extent on the colour of their skin, and whether this becomes pigmented or tanned. Sunburn is a protection from the sun's rays, and fair people do not tan, though sometimes they may freckle.

Children should spend at least six to eight hours a day in the open air in the summer, and four hours in the winter. They should be out in all weathers except fog and cold east wind, because even when the sun is not actually shining, there is a certain amount of ultra-violet radiation reflected from the sky. In order to get a proper amount of sunlight in the home, windows must be opened, and the casement variety is to be preferred to the sash.

Sunlight is the best disinfectant that we know; after any illness all garments, furniture, rugs, etc., should be placed out of doors, or by the open window.

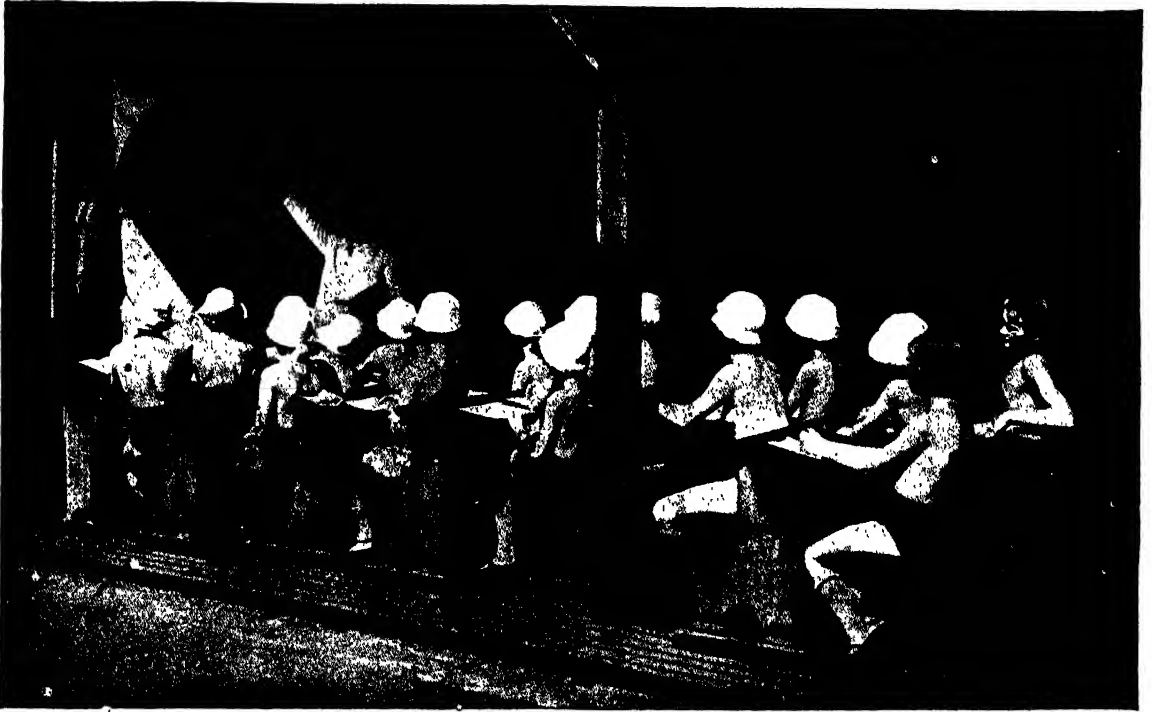


DRESSED FOR SUN-BATHING

[Photopress]

A pen of happy youngsters restored to health by sunshine at Queen Mary's Hospital, Carshakton.

SUNLIGHT AND HEALTH



[Keystone

THE SCHOOL IN THE SUN

By C. W. SALEEBY, M.D., F.R.S.E., F.Z.S., Chairman of the Sunlight League ;
Author of "Sunlight and Health," etc.

THE ideal school, towards which we must ever try to approximate, was founded by Dr. A. Rollier, at Cergnat, just below Leysin, in the Alpes Vaudoises, in 1910. Since 1903 he had been treating tuberculous children by sunlight at Leysin, and the establishment of what he called *l'école au soleil*—the school in the sun—was the logical sequel to the superb results which he had obtained.

The school is for normal children. Most of the scholars, however, have been sent there by their parents because they have given cause for anxiety, especially in cities, during past winters. They do not grow properly, or cannot throw off bronchitis, or are even what doctors call pre-tuberculous, which may really mean that tubercle bacilli are already invading them, without definite symptoms. But the idea of the ideal school, as this is, must surely be to serve healthy childhood, and maintain it in

health whilst it achieves the familiar miracles of growth and development. The glorious results of the school in the sun, with pupils on the whole decidedly subnormal, point conclusively to the principles on which we should all provide for healthy children, and not merely for those whom, by suitable methods, we have first made sufficiently ill.

The school is more remarkable in the winter than in the summer, and though we cannot emulate the Alpine winter Open Air. climate, we can still learn lessons for our children from the winter scene. First, the school in the sun is an open-air school, of course. In this country we are, at least, accustomed to that phrase. Near the beginnings of the present century the Germans established an open-air school at Charlottenburg for delicate children, and Sir John Gorst described it in the volume, *The Children of the Nation*, which he contributed to the New Library of Medicine



"THE SCHOOL IN THE SUN"

A class at Dr. Rollier's famous open-air school in Switzerland.

notopress

twenty years ago. In this country we now accept that idea. But it is necessary to observe that, if we are clothed so that only the face and hands are free, only the face and hands are in the open air. The children at the school in the sun spend by far the greater part of their working hours in bathing slips, or simple brief bathing costumes for the older girls. Thus their bodies are really in the open air, and not in the unnatural climate—dark, humid, and stuffy—which we create for our skin, under our usual clothes.

And, since the sun is shining, this open-air school is also a school in the sun. Not only are the desks and chairs and books in the sun, but the children's bodies are in the sun, for work and play, during many hours every day, with all the consequences for health which follow that exposure and that release. During the winter, when the dry snow is on the ground and the air is very cold, the children cannot sit nude at their

desks, even in the delicious sunlight, unless the air is still, and provision is made accordingly. At once we learn a lesson for ourselves. It is the importance of the wind-screen. In our climate there are countless occasions when life in the open air would be possible if only we could be sheltered from the wind. We do not appreciate the value of the wind-screen. This instrument, easily movable, should be supplied and used in all our schools, and should be made of "Vita" glass, in such wise, that on certain occasions it would allow the morning ultra-violet sunlight, for instance, to reach our children, even though an ungentle wind were blowing from the east.

Also, in winter and in summer, the children play many games and sports—dancing, skipping, skating, skiing, tobogganing, and so forth.

Sport and Diet. The type of body produced under these conditions is that which all admire and all desire—the body of the athlete. No

SUNLIGHT AND HEALTH

attempt is made to fatten the children. They do not become fat, they simply become fit. "Lacto-vegetarian" is the term which indicates the diet of the school in the sun. Eggs are included, and an abundance of fresh vegetables. Alcohol is absolutely taboo in all its forms, as in the clinics at Leysin itself, with their incomparable results.

Under these natural conditions not only do the children flourish, but the epidemics taken for granted in all our schools Immunity are unknown. Nature's anti-^{to} Infections. septic is constantly destroying infection, the movement of the air is constantly diluting it, and the strong young bodies are fortified to resist what remains. In our country we often call ourselves democrats, and doubtless there is much to be said for the principle that what one has all should have, but we apply it in imbecile fashion when we herd together children with incipient measles, the immune and the susceptible, excluding antiseptic sunlight, and promoting "mass-infection,"

as if our object were to spread disease. If that were indeed our object we could do no more to further it.

It has been said that, at the school in the sun, the children's bodies thrive, but of course they cannot be expected to learn anything. "Can we, then," says Dr. Rollier, "only be serious in a prison?" The experience of the teachers at the school in the sun assures us that the children do learn well under such conditions. Perhaps we might expect a brain to function better when fed with pure and richly aerated blood. After all, no better thinking has yet been achieved than stands to the credit of the academic, peripatetic, and stoic philosophers of Athens, all out of doors, as their names indicate. Let me add that, recently, at the Treloar Hospital in Alton, Sir Henry Gauvain has made long and careful comparison between sets of children who respectively received and did not receive doses of light, and found that the former gained conspicuous advantages in



[Photopress]

A PRACTICAL DEMONSTRATION

Sun-bathing is now being tried even in schools in our large cities. A geography lesson at Clapham Common.



BACK TO NATURE

Central Press

Sun-bathing is practised at this Norfolk school whenever weather permits.

terms of their scholastic attainments. For the mind and for the body, and not least for young eyes, the dayspring from on high and the breath of the morning are henceforth to be preferred to the scholar's midnight oil and the smoke of its burning.

For our country and our children what can we do? The open-air school is to be regarded henceforth as the normal school for normal children. I recall an American cartoon of a boy looking wistfully over the wall of an open-air school and asking the teacher, "How ill must a fellow be to get in there?" The experience of open-air schools, *all* for ailing children, even in our climate, is uniformly favourable. At Chailey, at Alton, at Carshalton, at the Bruce-Porter home in Folkestone, these triumphs of medicine and of education may be seen.

In our cities what can we do? We must vigorously enforce the Public Health (Smoke Abatement) Act, 1926, which came into force on 1st July of 1927. Having thus controlled the factory chimney, we must work for the principle of smokeless housing. Having thus restored at least a fraction of our ultra-violet sunlight to our cities, we

must put together the brains of doctors and architects, in order to devise open-air schools fitted for our climate: quick shelter must be available against its quick changes. Orientation must be studied, to yield the maximum of sunlight. "Vita" glass must play its part, for windows and window-screens. And, finally, we must somehow counter the cold. Central heating and plenum systems of ventilation are to be condemned. They are not natural. They paralyse the skin and lower the resistance of the lungs. We must go back to the ancients and copy their "hypocaust" by means of hot water or steam pipes under the floor, slightly warming it. Hence warm, dry feet for the scholars, and an upward movement of slightly warmed air. Any further heat needed must be radiant, as from a good modern gas stove. Warm feet and cool heads go well together.

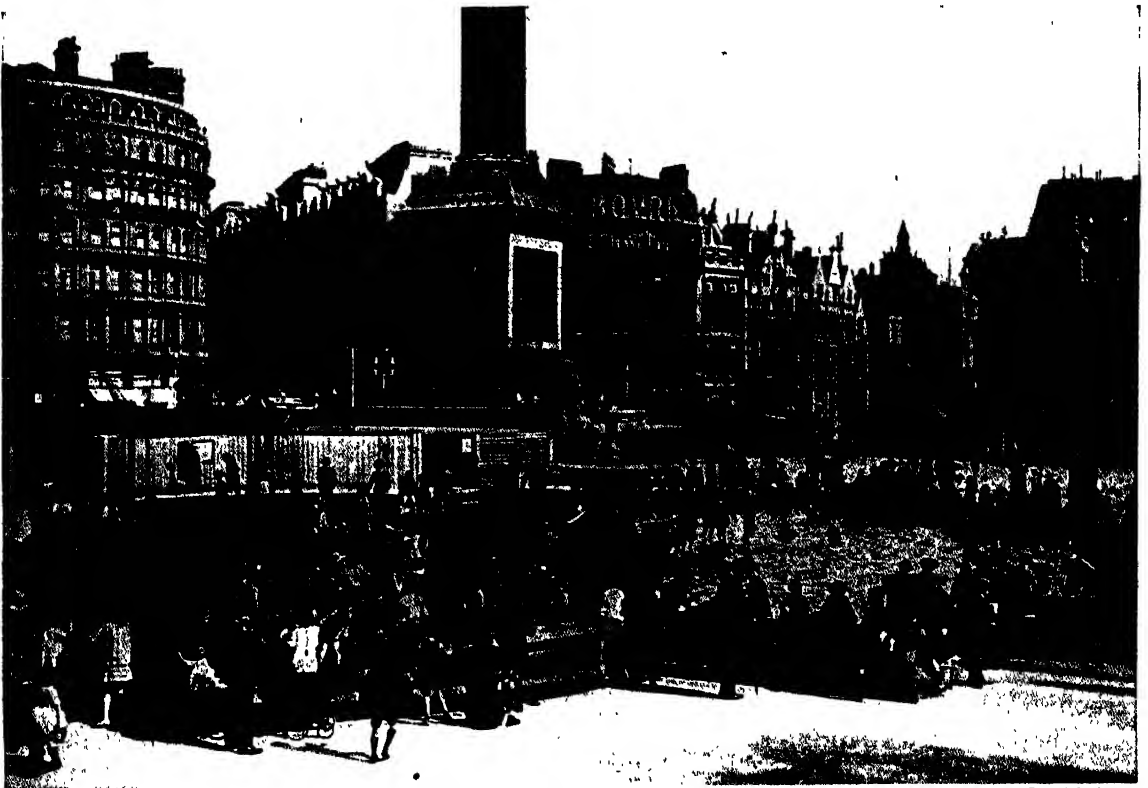
Last of all, we must invoke the aid of artificial sunlight, yielding some heat rays in cold weather, as well as ultra-violet, in order to supply our children with that of which our coal-smoke and our abominably designed cities deprive them.

SUNLIGHT AND HEALTH

During the long summer holidays, we must adapt the schools of the future to the purposes needed by children. It is time to stop the perpetual and ever-increasing record of children smashed and smothered in our streets, because they have nowhere else to play. Three years ago I attended the International Congress against Tuberculosis at Lausanne. We were, during one afternoon, horribly crowded in an unventilated lecture-theatre, a typical assemblage of doctors, and listening to a discussion as to whether or not innocent bacilli could ever become deadly. I thought to myself that it would be a poor germ that could not become deadly in such an atmosphere—and left for the Lake, where I could have a swim and resume the process of respiration. There I found a crowd of happy nude youngsters, enjoying the baths of water, air, and light which every child should have. I learnt that they were the school children of Lausanne, and that all

through August and September, part of the beach—the visitor may see it at Vidy, just next to Ouchy, below Lausanne—was reserved for them by the Town Council. On inquiry at the Medical Office of Health, I learnt that new cases of tuberculosis were ceasing to appear amongst the school population of the city. Thus the ideas and practices of Rollier are spreading, and the day approaches when mankind shall have seen the light, shall sin against it no longer, and the clinics at Leysin, now the most significant medical institution in the world, shall be needed no more than our generation needs the lazar-houses of the Middle Ages.

Ever since that day I have sought to have the garden squares of London opened, during August and September at least, for use by our school children. The “day in the country,” as against 364 days passed where no child should live, is not good enough. Any open spaces in the heart of London should be made accessible to children.



(D. McLeish)

YOUNG LONDON SEEKS THE SUNSHINE

The fountains at Trafalgar Square afford the only summer playground for many London children.



[Photopress]

SUNLIGHT IN INDUSTRY

By *GEORGE SOMERVILLE, M.D., D.P.M., Deputy Medical Superintendent at the West Ham Mental Hospital.*

WE are living in a New Age ; and whilst our chief industrial competitors have been able with comparative ease to introduce better conditions to the great gain of their industrial populations, influencing both the output and the emotional lives of the workers, we, faced with the greater difficulties of older foundations, prejudices, and customs in occupation, along with internal and external debt, have been unable to introduce, on a large scale, similar methods to improve the standard of life of the community.

The mass of our population spends two-thirds of its waking hours removed from the light which is, or should be, as natural to it as the necessity for food and drink. The chimneys in our industrial centres belch forth their smoke, and a myriad domestic chimneys add to the pall of heavily carbonised atmosphere which curtains our lives from the sun's vitalising rays.

For many years now scientific workers in different parts of the world have been conducting researches into the effects of

light and heat in relation to human life, and especially to the cure of definite disease. Actinic rays, similar to those in sunlight, can be produced by means of electrical energy activating lamps of various types, and the use of so-called "artificial sunlight lamps" has produced astonishing results both in the field of preventive medicine and in that of healing. Moreover, it has been shown in practice that these results have been secured in regard to those diseases to which, in this country, the industrial population is especially subject, namely, the rheumatic affections, certain forms of tuberculosis, rickets, and anaemia.

With the foregoing reflections prominently in their minds, a number of medical and lay workers, interested in national

A Natural Demonstration. efficiency and industrial welfare, determined to conduct an experiment with a view to its possible national application. The mining industry was selected for the purpose of this demonstration for the reasons that it is representative of a large part of our industrial com-

SUNLIGHT AND HEALTH

munity ; that there is evidence from several mining districts that the diseases chiefly prevalent there are those which militate against the well-being and efficiency of pit workers, and are those which will benefit from artificial sunlight—for example, the rheumatic affections, one of the greatest causes of industrial disability ; that, owing to the disruption in the industry, the psychological results would prove highly interesting ; and, finally, that the administration and organisation would permit of a considerable number of those employed being collected at a convenient place, with power, water, and building facilities available.

• In order to interest the mining population, the managing authorities of the Sherwood Colliery selected a few boys at random, as a fair example of the younger life of the pit, and sent them to Switzerland for seventeen days. The treatment given followed the general principles of Dr. Rollier, at Leysin, and gradual exposure, beginning with the extremities—head, legs, and arms—to the sun's rays during the cooler part of the day was conducted, varying in each case with the degree of natural pigmentation, until, during the final three days, the whole body was exposed to the sun's rays above snow-level for several hours.

On their return, the lads' parents, families, and fellow-workers—unfamiliar with the truths as to light, diet, and the healthy ways of spending leisure-time—were amazed at the

remarkable physical improvement visible in all.

The success of this demonstration at once assured the keenest interest amongst both the management and the colliers, and the erection and equipment of a pit-head clinic was immediately proceeded with.

A large clinic of bungalow type in timber, upon a brick foundation, was completed at the pithead, and equipped at a total cost of about £1500. Baths of water are provided. The baths of light proceed from six large mercury vapour quartz lamps, aided by four heat-producing lamps. The walls are white, and reflect a large proportion of the ultra-violet light that falls upon them.

Artificial sunlight from such sources, whether used for the treatment of definite disease or for its general tonic effect, in no circumstances should be given, or taken, except under the supervision of a qualified medical practitioner, and consequently a doctor, who had experience of the use of



THE PITHEAD CLINIC AT SHERWOOD

Sir William Arbuthnot Lane (first on left), and Sir Bruce Bruce-Porter (third), inspect the clinic.

[Photopress

THE GOLDEN HEALTH LIBRARY

natural and of artificial sunlight, was appointed to the clinic.

The experiment was not difficult to conduct. Lads came forward freely, displaying interest and enthusiasm.

Results Obtained. A hundred pit boys were selected and divided without discrimination into two groups of fifty for the purpose of "treatment" and "control."

One group of fifty was given ultra-violet light, and the other group was used as a control. At the outset of the demonstration both groups were weighed and measured. The "treatment" group received twice weekly exposures, starting at two minutes front and back, then gradually working up to six minutes each way, at a distance of two feet from the lamp.

At the end of three months the boys of each group were reweighed and measured.

RESULT

<i>Average Gain in Weight per Boy.</i>	<i>Average Increase in Height per Boy.</i>
Treatment group— 4 lb. 6.28 oz.	0.762 in.
Control group— 2 lb. 10.24 oz.	0.50 in.

The general appearances of the fifty boys in the "treatment" group improved considerably. A marked air of brightness and cheerfulness was noticeable as compared



ON TOP OF THE WORLD

Lieut.-Col. G. S. Hutchinson, D.S.O., M.C., who organised the Sherwood Colliery experiments, with a party of pit lads sun-bathing in the Alps.

with the "control" group. Nearly all the boys in the "treatment" group stated that their appetite had improved and their work seemed easier.

The results were obtained in spite of the fact that the boys were subsisting on a deficiency diet, in which there was an almost complete absence of all the known vitamins, mineral salts, and roughage, since the diet contained neither fresh fruit, green vegetables, nor salads, and the bread was white.

Although the clinic was opened for the purpose of

Other Attendance. the specific demonstration,

adult miners and their wives and children were encouraged to take advantage of it. The interest taken in the experiment by all grades of labour was remarkable. In a few weeks over three hundred employees were attend-

ing the clinic regularly. These men were of three classes: (1) Healthy men taking treatment for tonic effects; (2) accident cases; (3) sickness cases.

Many of the men who took a course of treatment were definitely of the opinion that it had done them a great deal of good. In accident cases the good was obvious, and marked even to laymen. Amongst those suffering from definite disease the greatest numbers treated were within the groups of rheumatic and skin diseases, all

SUNLIGHT AND HEALTH

of which benefited, some of them in a remarkable manner.

Not the least important and interesting experience was the daily attendance at the clinic at the pithead of the wives and children of the colliers. All who thus participated in the treatment expressed the opinion that they have derived real benefit from it. More than one nursing mother stated that such treatment had undoubtedly increased lactation, thus bearing out the experience of others in this field.

In view of the fact, amply demonstrated at Sherwood, but also in all similar clinical practice, that certain specific diseases to

which we, as a nation, are especially subject—namely, rickets, rheumatic affections, skin diseases, and surgical tuberculosis—can be greatly relieved by sunlight treatment, and that these diseases are the cause of much absenteeism in industry, it is recommended that in the interests of national health such clinics should be developed by all who have the authority to facilitate such projects.

The installation of a sunlight clinic is a matter of comparatively small cost, and such clinics, set up at the pithead or the factory gate, would unquestionably lead to an improvement in the physique and general health of our industrial workers, with its inevitable beneficial effect on our national prosperity.

SMOKE ABATEMENT

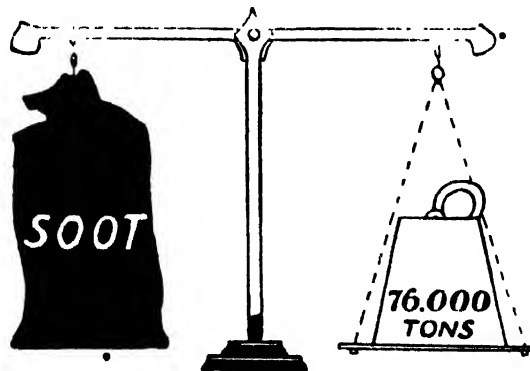
By C. W. SALEEBY, M.D., F.R.S.E., F.Z.S., Chairman of the Sunlight League ;
Author of "Sunlight and Health," etc.

THE urgency of the smoke problem remains untouched by recent legislation. Even now, as before the coming into force of the new Act, comparison between the intensity of ultra-violet light in London and at Peffard in Oxfordshire, a few miles outside London, demonstrates the undiminished obstruction of these precious radiations, and the same is true of all our cities. Such observations should be extended. They are very simple, when made by the colour-method introduced by Dr. Leonard Hill, F.R.S., and the cost is negligible. These records, taken in various parts of the cities in which four-fifths of our people live, will furnish guidance to enlightened civic authorities as to the progress of their measures for smoke abatement.

Two evils are to be dealt with—the smoking chimneys, and industrial and domestic. When

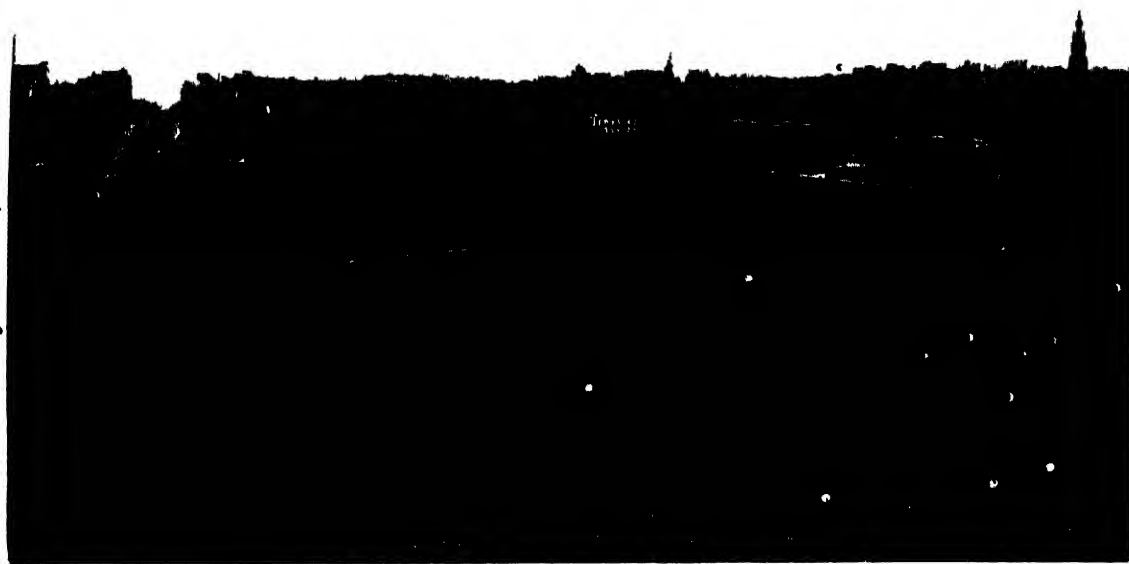
I visited Pittsburgh in the course of this inquiry, in 1920, I was informed that the principal factors in the great reduction of industrial smoke effected there were two—the automatic stoker and the use of pulverised coal. These were mentioned in the evidence given to Lord Newton's Atmospheric Pollution Committee. They remain of the first importance. The automatic stoker supplies fuel continuously, and averts the need for periods of black smoke, which are a public danger, even though limited under the new Act to two or three minutes per hour. The use of powdered coal is a vast economy of fuel, abolishes industrial smoke, and has succeeded wherever it has been tried. At last, our shipowners and manufacturers are beginning to hear of it.

But the domestic chimney is responsible for five-sixths of our urban smoke, and its treatment requires other methods. Our



LONDON'S ANNUAL SOOT FALL

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(Contd.)

[British Commercial Gas Association]

A SUN-BATHED CITY

The shopping and residential quarter of Edinburgh on a summer's day when no smoke polluted the atmosphere

new knowledge of the value of sunlight and of pure air should act upon health and housing authorities everywhere, so that, in new housing schemes, provision for smokeless cooking and heating may be made. In some enlightened localities this is being done, a notable instance being the new garden suburbs for families of modest means, which have been laid out by the municipality on the outskirts of Dundee. That municipality runs its own gas supply, and has installed a gas cooker in each kitchen, and has also supplied, from a central source, hot water for every family night and day.

What are we to do in existing houses, such as must, for many years, constitute the vast majority of all that we occupy? The

first thing is to survey our power-resources. We may consider electricity and hard coal, for instance. The advantages of electricity for domestic lighting are familiar. It has

recently served us very well in the provision of artificial sunlight, with its manifold uses. We have no alternative there, for the experiments made a few years ago by the gas industry failed to devise any mantle that would yield, when luminous, a useful proportion of ultra-violet rays. But electricity is, for the most part, far too costly to use for general cooking and heating.

The use of hard coal is similarly ruled out by the simple fact that the supply of it in this country is trivial, relative to our needs. Future use of water-power may reduce the cost of electricity in some fortunate areas, but our total possibilities of hydro-electricity in this country will never remotely meet our need of power.

There remains the use of gas. This agent has been increasingly employed, especially for cooking, in our cities during the present century, and this fact explains the very considerable smoke abatement that

SUNLIGHT AND HEALTH



Courtesy]

[British Commercial Gas Association

THE POISON CLOUD

Another view of Edinburgh, showing a dense pall of smoke, mainly from domestic chimneys.

has been achieved since our darkest days. Nevertheless, it is estimated that some half

million women still get up in Gas. London every morning to light a

soft-coal fire to cook breakfast ; and thus eclipse the light of day. Their efforts can be readily observed and timed by periodic examination of the amount of coal smoke retained in cotton-wool filters after fixed amounts of air have been drawn through them ; and thus we observe, for instance, that the peak of atmospheric pollution in our cities begins to rise sharply an hour later on Sundays than on week-days. In this connection we may recall the official estimate that, if Manchester had only the same proportion of atmospheric pollution as Harrogate, it would save not less than a quarter of a million pounds annually in washing bills alone.

For heating a living-room we require true radiant heat, after the perfect manner

of sunshine. The principle of "central heating" is physiologically unsound, as Dr. Leonard Hill's researches have abundantly demonstrated. A pleasant coal fire may please us, so long as it is not smoking at our end, but merely at every one else's : but that fact of the pollution of air and light condemns it. An admirable substitute source of radiation is furnished by the modern gas fire, properly ventilated. A quite new piece of research has resulted in the invention of radiants which cause such a fire to emit a radiation, the spectrum of which much more nearly resembles that of sunlight than formerly. Such a radiation does not dry the skin, and even contains a small proportion of ultra-violet rays.

These are the lines on which we may abolish—nay, are now abolishing—that pestilent congregation of vapours which deprives us of the dayspring from on high in all our cities.



[Kodak Snapshot]

HEALTH THROUGH NUDITY.

By K. DE MONGEOT, Director of "Vivre," Official Organ of the League of Physical and Mental Regeneration.

FOR fifty years the Germans have conducted an enthusiastic and persistent campaign in favour of the practice of complete nudity, their object being the improvement of health and morality by rendering familiar, to adults and children of both sexes, the view of a human being such as God made him.

The numerous German nudist leagues number close to three million adherents. Some of these associations are made up of small Prussian country gentlemen; others of communists. One of them has been brought together with the sole object of enabling its adherents to live more easily a chaste life.

In France, one single league actually exists, and that was only formed quite recently. The number of its adherents is already very considerable. It establishes daughter-leagues in every part of France as well as in the principal centres of her colonies. Its name is "Vivre," the League of Physical and Mental Regeneration. Its motto is "Primum vivere deinde philosophari." The writer of these lines is the founder thereof. The Comité d'Honneur, which supports it in its heavy task, includes a very large number of well-known prac-

tioners, of barristers, and of personalities such as Professor Charles Richet of the Institute, Monsieur Andre de Fouquieres, etc.

At the dawn of a new civilisation, let us think of these words attributed to Christ: "The Kingdom of God will exist when you go about again naked and when you will not be ashamed of it." But, while waiting for this blessed day, let us occupy our thoughts with the positive part in the cure through nudity: health.

The being who would maintain his body in a perfect condition should be well acquainted with it. It is necessary that he should not be ignorant of human forms, of the colour and the quality of his skin, and of the play of his muscles. He should know how to examine himself from an experience similar to that of the trainer who sees at one glance the condition of the thoroughbred entrusted to his care.

To hide his body even under a thin undergarment is then a primordial error in him who would develop harmoniously and keep his health the source of placidity or of happiness, for the solar light has the most happy influence on our organism, and we must emphasise the considerable part it plays in general nutrition.

SUNLIGHT AND HEALTH



A DAUGHTER OF EVE

[N. Roberts

THE GOLDEN HEALTH LIBRARY



FOUR SUN-BABIES

[Kodak Snapshot]

the epidermis of a clear yellow pigment, which, in blondes, pales and disappears quickly on the cessation of the solar action. According to numerous and diverse experiments, it would seem certain that the organism makes use of the pigment as a means of defence against infection.

Let us consider the circulatory system. Under irradiation the superficial vessels dilate, lowering arterial pressure, and thus

The solar rays favour growth, stimulate the appetite, increase the muscular tone, strengthen the nervous system with two antagonistic actions—one, soothing for blue light; the other, stimulating for red light.

The respiratory and nitrogenous exchanges increase slightly, the weight increases, proving an intense fixation of alimentary material. The skin and the hairs become pigmented; the blood gains in the number of red and white corpuscles; the contents in haemoglobin increase in the red globules; the resistance of the body to infection is increased; the whole organism is powerfully strengthened.

Let us now examine that beneficent action in the various organs.

On the skin, an organ of elimination, but, in insolation, an organ of absorption *par excellence*, the light provokes a stronger growth of the hairs and of the nails, and especially a coloration more or less deep according to the complexions and the races, due to the fixation at the base of the transparent layer of

relieving the heart; the pulse is ordinarily slightly accelerated. The white and red corpuscles increase very rapidly in the blood; the figure has even a tendency to surpass the normal number of 5,000,000 per cubic millimetre.

The nervous system is markedly strengthened; ideation calmed, irritability diminished, a joyous *bien être* establishes itself; pains are soothed.

The glands secrete abundantly, all without exception, whence abundant urine and perspirations which purify the organism. The glandular activity of the digestive tube stimulates assimilation and rouses the appetite.



HAPPY MUD-LARKS

[Kodak Snapshot]

Making the most of a summer's day on the Thames.

•SUNLIGHT AND HEALTH

The action on the endocrine glands is powerful, producing an effect comparable with that of a general tonic treatment with extracts of these glands, but with an energy and a harmony incomparably superior.

And it is here that the benefits of complete nudity are proved, for it suffices to insolate a subject for a fortnight entirely naked, then for another fortnight to hide the testes or the thyroid body; the weight curve registers perfectly

unless indeed it itself exercises endocrine functions.

It is therefore indispensable for him who would preserve his health, postpone the limits of youth, and live in a state of well-being, to free himself each day, for the longest time possible, of his clothing, and to expose his skin to diffused light and to the air.

Our skin possesses a marvellous regulating apparatus, thanks to which we can face all atmospheric changes, so long as they are



[Keystone

PITCHING THE TENT •

The beginning of a happy open-air holiday.

the inhibitive action of the fig leaf and the muffler. If one has to deal with anaemics having a weight very much lower than the normal, the demonstration becomes striking.

The skin is not only a covering for the body, but a very important organ, sharing in the general life, and, especially, in the chemical life of the being. It is more than an organ of defence and excretion or of absorption, for it seems directly allied to the functions of glands of internal secretion,

not absolutely exceptional. The circulation is never as active as during extreme cold, when we take exercise.

It cannot be doubted that the human being has everything to gain by living in conformity with the laws of nature, and to avoid putting the least obstacle between their beneficent influences and his organism is absolutely vital. The human body is unable to fulfil its functions satisfactorily without light and without air.

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HEALTH IN THE OPEN AIR

By B. PASSMORE BISHOP ("Strongheart"),
Author of "*The Campcraft and Woodcraft Papers*,"
etc.

COME out!—away into the sweet countryside where the gentle breezes play, along the by-paths and uplands, through meadow and by stream and coppice. Come out, and let the clean air and exercise invigorate and re-vivify you, and the wondrous beauties of Nature act as a tonic to your mental faculties. To the ordinary normal being there comes an intense longing to be up and out, for deep down in nearly all of us there is an inherent urge that continually takes our thoughts to the great open spaces and makes us wish for a more carefree, simple life. To many this inspiration has to be satisfied with a little trip to some favoured, and probably well-tenanted, spot, simply because a real understanding of how best to realise and glorify one's innermost longing is lacking. He who would find the full beauty must leave the high road and the common speedways, get off the beaten track, cast off the ordinary trammels of the everyday world, and find the greater happiness in living the simple life close to Nature. The real simple life that I want you to try is one that you will glory in—if you will but test it.

Give these few hints of mine a real trial, for herein lies golden health, and I can promise that if you will but take the matter in hand, earnestly and thoroughly, the effect on your physical and mental well-being will be really wonderful.

This real love of the open air is crystallised in the simple word "camping." Now of all things that are travestied or misunderstood, I think that camping holds the palm. Most of us have an instinctive longing to camp; there is an impelling glamour about it that makes it a romantic mental ideal—but comparatively few as yet dare to adventure. To the uninitiated, camping seems fraught with discomfort and an entire absence of the little home touches that seem to matter so much. In addition, many are actually

debarred from striking out because of the imagined dangers to health. This aspect of camping is all sheer ignorance.

You must, however, be a real live camper, and not simply wander off with a few others and just idle through the days, to come home at last rather dubious as to whether you have really enjoyed camp, or whether the "roughing it" was not rather irksome. I am afraid that many who go to camp unprepared *do* get this impression. They take no trouble to realise that the glorious game requires proficiency.

The first equipment to invest in is something that cannot be bought; you cannot purchase it in tins down in the village, but yet you must take it with you, and whatever you do, you must not lose it or it will not be a camp at all, but a mere parody of one. What is this wonderful thing? Merely the "cheerful spirit." You cannot run a camp without it, and when once you have cultivated it you have the greatest asset that you can possibly have.

And now the question will arise—who can camp? Is it just for the few young men who can more easily tackle this kind of thing, or can we all become campers?

I do not care who you are, or what are your ordinary vocations, or your age or your sex. This great open-air life is available to all, and whether you are sturdy and strong, or weak and delicate, nothing can come of it but the utmost good. From Cornwall to Norfolk, I found my camper friends last year—in little batches—mixed camps, small camps, large camps, girls camping alone in their twos and threes, and the solo camps of the hikers, who carried their little canvas homes for miles and miles, setting down wherever the whim caught them, and seeing the real countryside in a way that is most enchanting.

The first point for consideration to most will be—where can we camp? Cast about in your mind for some happy spot that has left a lingering memory. Find out who owns the land, and write or visit the owner, and courteously ask for permission.

SUNLIGHT AND HEALTH



A SCHOOL CAMPING TOUR

The pupils of this school in Norfolk spend the greater part of the summer term out of doors.

Having procured permission, the site should be surveyed carefully, because here comes your first lesson in camp-craft. That little spot just by the stream-side, or that dell that looks the ideal place for a cluster of tents, will prove a snare nine times out of ten; so, on the other hand, will exposed places where, although they may be drier, the full force of the winds will be felt. The actual grass will tell you much, even though for the moment the site looks dry; sedgy grass tells a tale of wetness and flooding; so also does long lank grass. Short, springy turf indicates a good well-drained soil.

The practised eye can rove over any possible site and read, almost at a glance, just where the water drains, and exactly what is to be expected if rains come. The ways and means of getting your paraphernalia to the site when the time comes should have a distinct bearing upon your selection.

Next you will want to fit yourself out with kit, and this can be accomplished at comparatively small cost, if you wish it, or you can lay out pounds. I will deal with wearing apparel first. I advocate for men just shirts, shorts,

and stockings—there is no finer garb, nothing freer or more utilitarian. For girls, the same costume is ideal for the privacy of the camp, with, perhaps, a short skirt for formal occasions.

The next item to be considered—and very carefully too—is the tent, your canvas home for, perhaps, many week-ends and longer sojournings.

I would first advise that you look up the firms who supply camping equipment, and get their illustrated price lists. These will give you in graphic form the many kinds that are upon the market. For first preference, look carefully at the cottage type of tent—one with quite high side walls and a good head clearance at the ridge. Remember—

you may be going to live in it in all kinds of weather. I incline, too, to the patterns that have an extra flysheet, but these are more expensive. You can get a good cottage-shaped tent, to hold two or four people, at quite a reasonable figure, but I do ask you not to stint a few shillings, but get something really strong and serviceable. Make sure of a good serviceable mallet and sufficient tent pegs.

At the same stores you must purchase a good ground sheet, solid and safe. You might also inspect the light-weight folding



TESTING THE JOINT

Girl guides take it in turns to prepare dinner.

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A LOG FIREPLACE

The fire is built between two hard logs upon which the saucepans rest.

camp beds, which will make all the difference to your slumber, because I would not recommend those who are camping for the first time to make their couch on hard Mother Earth. A sleeping-bag is very comfortable, especially to the novice who has had no experience of small size blankets.

Personal kit should be sufficient to ensure a thorough change of raiment; this is particularly necessary in our changeable climate, and is equally comforting when the weather is extra hot. Sound footwear is essential even in the finest summer, for dews are heavy, and wet shoes must be avoided. Stockings are a matter of taste in camp, but the more you can let the sun and



A BRICK FIREPLACE

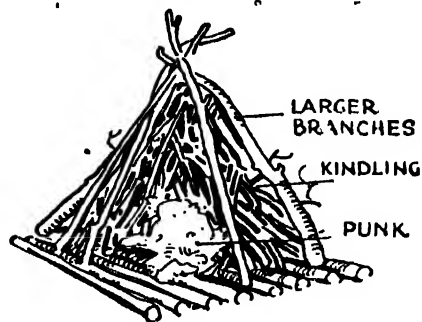
This type is efficient and easy to build.

air reach the body, the greater benefit will be yours.

Ordinary camp kit should present no difficulty, and is rather governed by the number of the party. You must

Cooking Apparatus. have something to cook in, for you must remember that camping does not mean an existence on tinned foods—far from it. Camping with a tiny tent, I have lived on fruit and cereal foods. I have roasted joints, and cooked glorious milk puddings, and baked simple scones. Over your table kit you can be just as fastidious in camp as at home.

The first real difficulty will be to decide upon the method of cooking your food. You may fancy a Primus stove for easiness. I have used them on many a hiking camp,



LAYING THE FIRE

The ideal arrangement for a fire in the open.

and found them of inestimable value when the sojourn at any spot is short, but to get the real charm of an open-air holiday you really want to make your fire in the open and do all your cooking by it.

I should put fire-building down as one of the chief attainments of a real self-reliant backwoodsman. The first object **Fire-building.** is to get the fire going, and then to build it so that in the shortest space of time you can get a hot mass of glowing coals that will cook perfectly. The Red Indians have a wise adage :

“White man fool, make big fire, can’t go near ;
Indian make little fire, and sit happy.”

You cannot be sure of getting a fire going just when you want it in our uncertain climate unless you set out to make proper

• SUNLIGHT AND HEALTH

provision for it, at least for the first kindling that means so much. It is no good turning out on a dismal morning, or even in the heart of summer-time when everything is saturated with dew, and think that all the necessary things will be easy to find. You should take a leaf out of the book of the lone hunter, who always has tucked away about him, probably in a waterproof skin bag, a little collection of dry tinder. Eschew

make a pile of shavings whittled from the heart of the log.,

When laying and lighting a fire, start in a small way, always; do not heave great quantities of wood on, but add it gradually as the fire gets hold. The first requirement is something dry and easily inflammable, such as the thin bark of trees, wood shavings, and dry tindery stuff; and, if you can find them, secure some strips of birch bark and



[Keystone]

ON THE NORFOLK BROADS

Hardened campaigners enjoying the simple life.

the use of paper and paraffin oil; this practice is not to be found in the book of woodcraft lore. I am not ashamed to own that I conscientiously gather up a little pile of tinder every night to add to my store when in camp. One of the greatest tests for the camper is the building of a fire in rainy weather, when leaves and twigs and wood are far from dry. When real dry stuff fails, choose an old log that is not water-soaked, split it with an axe, and split it in half again. With a sharp knife

treasure them, for they are full of resin and burn wonderfully well, giving out a fierce heat. Pine is equally good, and I always find that a strip or two of this is all that is required for "punk," as we call this foundation for our fire. To make a real foundation, and to provide draught, lay a row of straight, short branches on the ground at two-inch intervals, and then another row of shorter ones across them. On the centre of this place your "punk," and over it raise short twiggy sticks, wood splinters, and so on, in

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pyramid fashion, and then outside this a few large sticks of dry wood to provide something solid. As your flame grows add larger sticks, pyramid fashion, and then your logs, which should be inserted end on, like wheel spokes, as it were.

Building cooking fireplaces is a fascinating pastime. The most elementary kind is that

“Fire-places.” which simply consists of a rough bough held up by a forked branch stuck in the ground. This is easily prepared, and will answer very well. You will find that you will need to secure the end of the branch with a large stone or another forked branch to prevent the

weight of your pot from pulling it down. With a short fulcrum (so that the free end of the rod is nearer the fire) you can toast and roast quite easily, providing you have a good fire of glowing embers.

The next contrivance is the old familiar tripod of stout stakes, or you can make a per-

manent one of iron rods, which are easily obtainable. Lash the three together securely.

There is a little more ambitious but quicker method for cooking meals for a number of people, consisting simply of two logs about the same size, so that your pots can rest on top. A good hard wood should be chosen, or you will find that your fireplace feeds the fire very rapidly. Arrange your logs so that the wind blows directly up between them to get a good draught, and light up, as described before. I would like to point out that when you are camping, wood and logs must not be taken indiscriminately; find out just what you may, and may not take.

Set fireplaces are easy of construction and

easily put right when knocked about by wear. These are made up of old bricks which can nearly always be had wherever you camp, or even large stones will do if carefully picked out. When simmering, your cooking-pots can be lifted and placed at the side, where there is sufficient heat to keep them going well. A quick method—an old army way—of cooking dinner for a large number without waiting to construct any special fireplace, is to place the cooking-pots close up to one another and also on the top, so that they make their own flue.

For your food supplies, look to the surrounding country; eggs, milk, bread

can all Food Supplies. be had, and

practically everything else that a camper can wish for. To store your food, procure a box of some kind and “sling” it in a nearby tree. You cannot keep food and so forth in your sleeping-tent, and this method keeps everything sweet and



THE MORNING SWIM

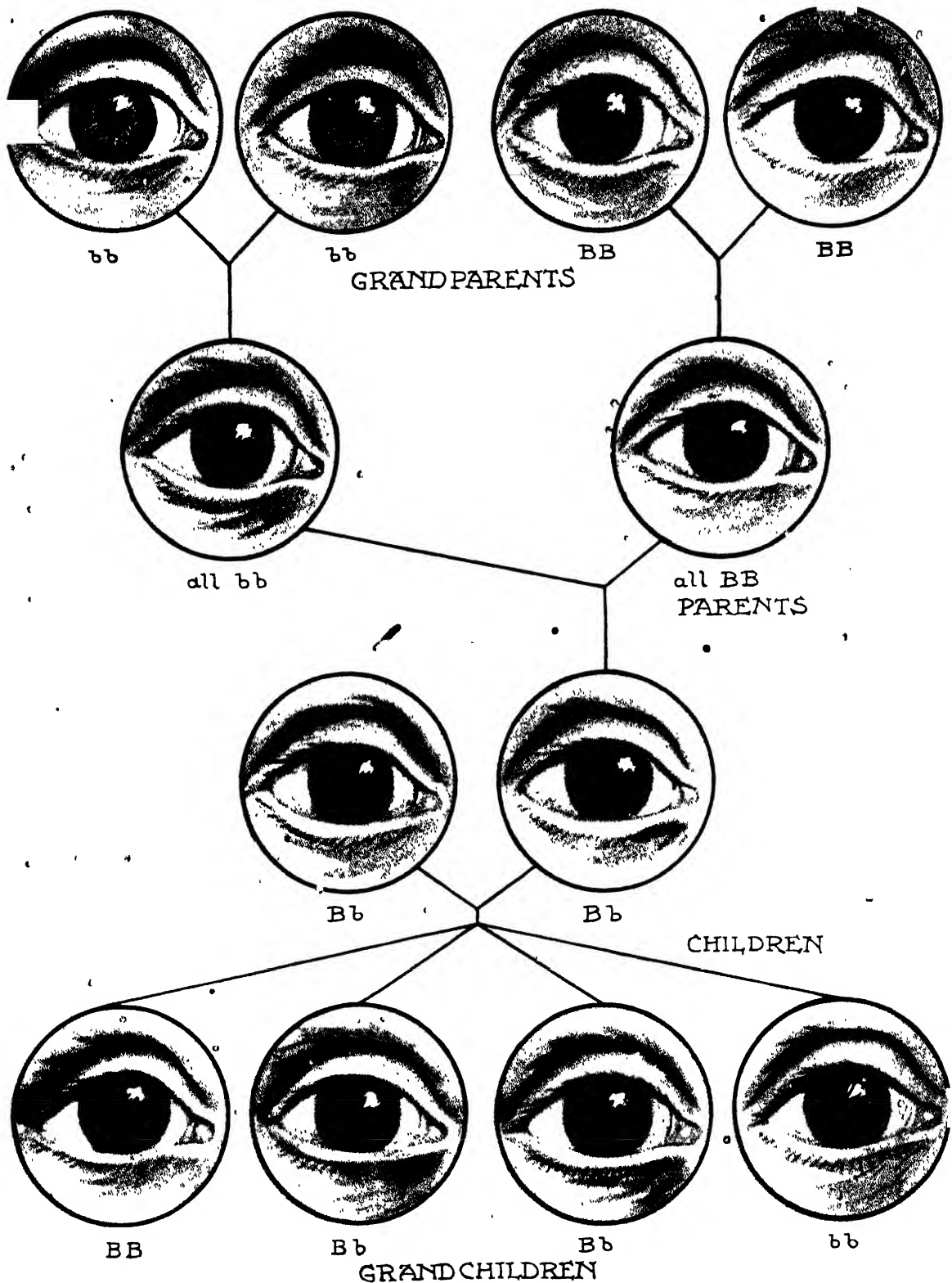
A nearby river or lake adds greatly to the zest of a camping holiday.

also safe from marauding animals.

Water is often a difficulty. Your drinking water must be above suspicion; do not allow any doubt about this, and look about until you can get supplies that are unquestionable.

Cleanliness in camp I always stress, both personal cleanliness and also in camp utensils and camp appearance. Personal cleanliness, however, seems to frighten many when under canvas; they do not seem to realise that with a few stakes and boughs and some yards of hessian a thoroughly screened “bathroom” can be contrived.

Here is where our promise of health comes in—good plain food, sound satisfying sleep, clean air, and fresh bodies, robust with exercise.



HOW EYE-COLOUR IS INHERITED

In the diagram each individual is represented by one eye only. Brown eyes are dominant over blue, i.e. brownness will mask blueness. Thus *all* the children of a pure brown-eyes (BB) and a pure blue-eyes (bb) parent will be brown-eyed. These brown-eyed children (Bb) will transmit blue-eye colour to some of their children, however, if they marry a person of similar (Bb) constitution. The Bb eyes are tinged with blue to indicate this power of transmitting that colour; actually they appear brown.

VI

SEX AND HEALTH

THE EVOLUTION OF SEX

By Professor J. ARTHUR THOMSON, M.A., LL.D., Regius Professor of Natural History at the University of Aberdeen.

WE are not much concerned here with the difficult biological problem of the origin and continued divergence of male and female organisms—a reproductive division of labour that has led to such striking dimorphism as is familiar in the contrast between stag and hind, male and female narwhal, peacock and peahen, male and female Bird of Paradise, and so forth. Our aim is to envisage the varied expressions of sex at different levels in the animal kingdom, in the hope of discovering some hints that may be of service in the quest for health. In the system of animate nature, to which man belongs, there has been for hundreds of millions of years a long series of experiments with life; and it would be surprising if this did not afford us some useful suggestions—warnings at least, but perhaps inspirations as well! Moreover,

the fabric of man's nature includes some pre-human strands, more or less transmuted no doubt, which he may be the better able to understand and to control when he sees them in their evolutionary setting.



(James's Press Agency)

A STRIKING SEX DIFFERENCE

A peacock and peahen, illustrating the strong dimorphism, or difference in form, between the two sexes, found in many birds and animals.

In the simplest multicellular animals, such as sponges and jelly-

Simple fishes,
Sex Forms. zoo-

phytes and coral, there is sexual reproduction in the sense that special germ-cells—the ova and the spermatozoa—are liberated from the body. This is physiologically more economical than the asexual method of giving off buds; compared with buds, the germ-cells are less likely to be detrimentally affected by injurious influ-

ences that have played on the parental body; moreover, by the egg-and-sperm method it is possible to give simultaneous origin to a large number of offspring; and a fourth advantage of sexual over asexual repro-

duction is that the offspring starts with an inheritance which usually includes the pooled contributions of two parents—an arrangement which tends to increase the outcrop of novelties or variations. It is not surprising, then, that from sponges to man there is sexual reproduction, though asexual multiplication may also occur, and though there is occasional parthenogenesis (reproduction without intervention of the male), as in the summer green-flies and the rotifers, where the egg-cell is launched on the voyage of development without being fertilised by a sperm-cell. Thus the drone-bee has a mother, but no father! The common dandelion is a good example of a flowering plant that has become parthenogenetic; but there are not many instances of this in higher plants.

Among backboneless animals there is a frequent occurrence of hermaphroditism (both sexes in the one creature), as in earthworms, leeches, and snails, where egg-cells and sperm-cells are produced by the same animal, though not usually at the same time. Yet in such cases, the ova of one individual are usually fertilised by the sperms from another individual. Self-fertilisation or autogamy is of very rare occurrence among animals, but it is illustrated by tapeworms and flukes. Among flowering plants there is a not infrequent occurrence of self-pollination, as in the edible pea.

Returning to sexual reproduction in simple animals, we wish to emphasise the fact that although there are usually separate males and females, there is no pairing. In most cases there is a localised bursting which liberates the egg-cells or sperm-cells, just as the anthers of a flower split up and liberate pollen-grains.

In some simple animals, such as certain sea-worms, there is a fatal reproductive bursting of the whole body. In the palolo-worms, e.g. *Eunice viridis* of Samoa, the nemesis is evaded by a liberation of the whole posterior body, laden with eggs or sperms, which bursts in the water, while the head portion, remaining in a crevice of the coral-reef, grows a new posterior region, which is liberated in the same month the following year. In all these cases where the germ-cells are shed into the water, the fertilisation of an ovum by a spermatozoon is more or less fortuitous, but the fortuity is lessened when the animals become ripe at the same time, and when many individuals of the same kind live in the same place.

In some cases the successive occurrence of reproductive maturity is markedly periodic. Thus one of the sea-urchins at Suez shows a remarkable lunar periodicity, the reproductive organs filling and emptying with regularity each lunar month throughout the summer. This sameness of condition in animals of



DANDELION FLOWER AND SEEDS

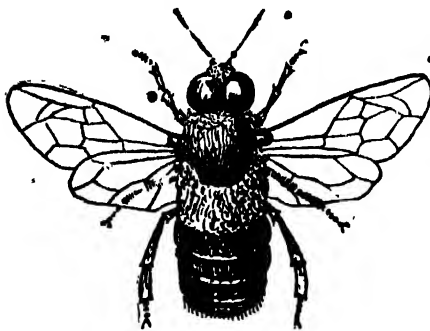
The common dandelion is a good example of a flowering plant that propagates itself without the aid of a male.

SEX AND HEALTH

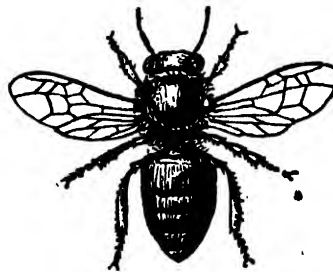
the same kind may have something to do with what may be called the infectiousness of sex-activity. Thus, if one sea-urchin begins to spawn, the others in the immediate vicinity may follow suit. In the slipper-limpet (*Crepidula*), propinquity seems to be necessary to sex-maturity. Such cases bring us to a second level of sex, where, though there is as yet no pairing, it seems to be indispensable to the liberation of the germ-cells that the two sexes should be near one another. The male salmon does not pair with the female salmon, but her reproductive activity, dropping eggs into the furrow she makes in the gravel, stimulates him to shed the milt or seminal fluid upon them. Many

æsthetic attraction. In exuberant diversity there may be appeals to the senses of touch, smell, sight, and hearing, the male animal usually playing the more active rôle. One thinks of the incense of some butterflies, the caresses of even cormorants, the display of the Argus pheasant with his hundred "eyes," the lyric of the nightingale, and a hundred other instances. In most cases the appeal made by the male evokes first the interest and then the sympathetic excitement of the female; but it must be clearly understood that, apart from individual variations, most of the courtship is instinctive. It is not thought out for the occasion; it is an

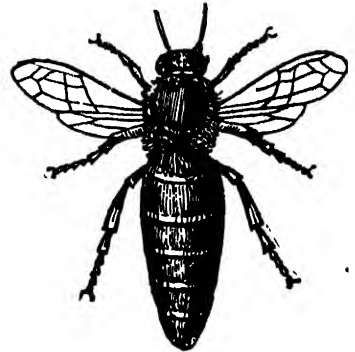
Æsthetic
Attraction.



MALE OR DRONE



STERILE FEMALE
OR WORKER



FEMALE OR QUEEN.

SEX FORMS IN THE BEE

Common bees present rather unusual sex forms in the animal world, since there are in reality three sexes. The drone bee has a mother, but no father.

fishes illustrate this stimulus of propinquity.

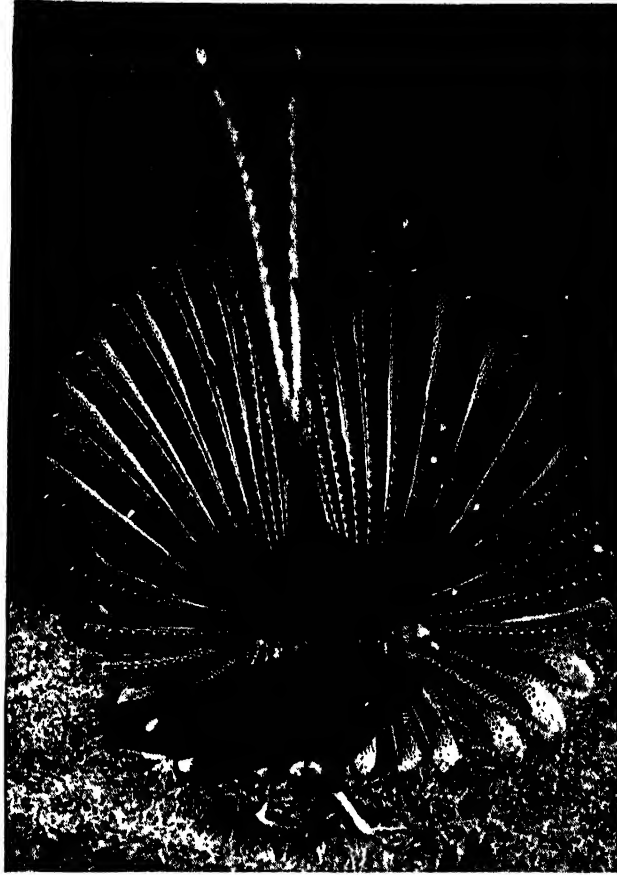
A third level, still a low one, is illustrated by cases where there is contact between the sexes, but no internal insemination of the female by the male.

Sex Contact. Thus the male frog grasps the female in a violent embrace, a familiar sight in spring, but the fertilisation of the eggs is external. As she liberates the egg-cells or spawn, he sheds the sperms. On the inclined plane of sex this stimulus of contact is to be associated with the various forms of fondling, as in some fishes, where there is no sexual union in the strict sense; and these caressings are, of course, continued to very high levels, as may be seen in various birds.

A fourth grade, marking the more definite beginning of animal courtship, is that of

expression of racially engrained neuromuscular pre-arrangements, whose release is no doubt suffused with some degree of awareness, feeling, and endeavour. It need not be supposed that the female bird is appreciative of every little detail of the male's decorations, colours, music, dances, and poses; it is probably the *tout ensemble* of the appeal that leads her to give the preference to one suitor rather than to another. But if the general basis of preference is consistently adhered to, from year to year, and from generation to generation, there is bound to be, as Darwin maintained, a genuine sexual selection, operating as a factor in evolution. In many cases the evidence of preferential mating is very strong, as in birds and in spiders.

A fifth level is illustrated when there is prolonged and subtle courtship before mating, and when it seems impossible to describe this without recognising that the psychical aspect counts. The decoration of a bower-bird's courting bower is often elaborate, and it seems to be enjoyed for a considerable time before there is any attempt at actual pairing. In some cases, such as the great crested grebe, there is a prolonged ceremonial which has no direct physiological utility, but serves to establish



[D. Seth-Smith]

THE MALE DISPLAYS HIS CHARMS

A male Argus pheasant displays his beautiful plumage to attract the attention of the female in the breeding season—a simple form of æsthetic attraction.

bonds between the pair who have not yet come together sexually. Without in the least depreciating the rôle of the sex-hormones in eroticising the body, we maintain that in many ways some emotional comradeship is established and psychical bonds are made strong. The nightingales' harmony is not altogether harmonic. Of much interest are cases where the song of birds, which is mostly confined to the males, is uttered by both sexes, as in the skylark, and where the courting and nuptial song is continued with considerable

emotional bonds that will help to keep the mates together after the sex-appetite has been satisfied. Occasionally there is something that approaches the use of symbols, as when great crested grebes offer one another little gifts of water-weed, or a male herring gull lifts little pieces of stick and grass stem, and throws them backwards over his head. Often there is a suggestion of nest-building long before actual pairing occurs—a suggestion which may imply a premature outcrop of the nesting instinct, and at the same time serve as a stimulus to the sexual appetency. When a female warbler joins her future mate in driving off intruders from the chosen "territory" or nesting site, there is a co-operation that strengthens the psychical

verve after the breeding season is over, as in robin and wren. Thus in the animal kingdom we see physical fondness rising into æsthetic attraction and that into emotional sympathy.

Seasonal monogamy finds many illustrations among animals, and a lasting monogamy, more difficult to prove, also occurs. Some degree of monogamy is an important progressive factor in evolution, for co-operation, as in the nurture, education, and defence of the family, tightens the psychical bonds and brings the sex-relationship nearer that complex which is called conjugal or marital love in mankind.

From the biological view-point some general facts in regard to sex in mankind stand out plainly. Man must recognise the imperiousness of the sex-urge which he

SEX AND HEALTH

has in part inherited from pre-human ancestors. It is a source of danger as well as of

Sex-Hygiene. strength, and it is best safeguarded when it is considered not in isolation, but as an integral part of the whole life. Pre-occupation with its physiological demands, especially when it is hidden away as an unclean thing instead of being "hitched to a star," is likely to lead to hyper-susceptibility and to foulness of outlook, if not also to bodily and mental disaster.

The sex-urge must be considered in relation to the hormones which are liberated from the reproductive organs, and may come to exert an overpowering tyranny. There are oversexed individuals who are not psychically lascivious, but the sex-appetite is apt to grow with the feeding of it, and it is physiological as well as ethical commonsense that man should try to avoid everything that leads physiologically or psychologically to artificial or over-stimulation of the reproductive organs and their potent hormone-producing tissue.

But the particular contribution which is suggested by our biological picture of the ladder of love in the animal kingdom is the idea of sex as an evolving relationship.

As we have explained, the story of animal evolution discloses an ascent of the sex-linkage. To physical fondness there is added æsthetic attraction, and to subtle æsthetic attraction there is added a deeper psychical sympathy, - strengthened in co-operative partnership. So in human love there should be these three notes—(1) of physical fondness, which is fundamental; (2) of æsthetic attraction, rising into emotional sympathy; and (3) of partnership in the business of life, in good weather and in bad, rising to intellectual and ethical comradeship in worthy, even if it be very everyday, endeavour. One of the biggest lessons of biology is the ladder of love, the evolution of sex, disclosed in the course of animal evolution.

Sex has been a factor in the evolution of mind and morals. It has been a spur to activity, acuity, agility, enterprise, courage, taste, emotion, sympathy, self-subordination, and control. And this evolution must not be allowed to stop. New impulses are still to come from the old fountain. If the old chivalry, with its shadows as well as sparkle, be out of date, there is need and also promise of a new chivalry. Sex is still evolving.



PROUD PARENTS

[S. Crook

Monogamy is an important progressive factor in evolution. The swan is said definitely to stick to one mate, and both parents defend their young with great ferocity.

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THE PSYCHOLOGY OF SEX

By GEO. SOMERVILLE, M.D., D.P.M., Deputy Medical Superintendent, West Ham Mental Hospital.

MAN is mortal, but the stream of life flows on, unbroken and apparently without end. It is the sexual division of mankind which renders possible the perpetuation and evolution of human life, and it is through the operation of the sexual instinct that this end is accomplished. Not only is this instinct a dominant biological force: it is also a prime motivator of personal and social life. It stimulates the desire to live and to create, causing mind as well as body to be fruitful; it is the secret of the "joy of life." In art, literature, music, and religion its inspiration is revealed in refined and beautiful form; it is the keynote to the drama of everyday life. Its manifestations are both many and unexpected, subtle as well as striking; it gives colour and tone to the business of our lives.

That all adults should possess an accurate knowledge of sex and its problems is accepted to-day, for it is fully realised that blissful ignorance or faulty information is a danger to personal happiness and social welfare. Although Nature herself teaches us a great deal about sex, we cannot afford, from prurient reasons, to ignore the enlightenment of Science. Ignorance leads to an unhealthy fear and degradation of sex, with inevitable evil consequences. Consider the innumerable divorces indicative of ill-assorted marriages; the hosts of neurotics; the thousands of prostitutes in every large city, and the preventable disease inflicting misery on the innocent.

These social evils are largely preventable, and must be prevented, for history has revealed repeatedly how once mighty nations under the influence of sexual corruption—the penalty of wealth and luxury—have degenerated and decayed. There can be no reasonable doubt that sound education in the physiology and psychology of sex

would go a long way towards the solution of the "sexual problem," and would lead to a healthy purity of individual and social life. We must be prepared to talk cleanly about sex, to avoid lewdness, and to conceive a high sexual ideal which will render the relationships of men and women beautiful and joyful.

To gain a scientific understanding of the psychology of sex, a preliminary consideration of the sexual instinct is essential, for upon this inherited disposition all that pertains to the sexual life is founded and sustained.

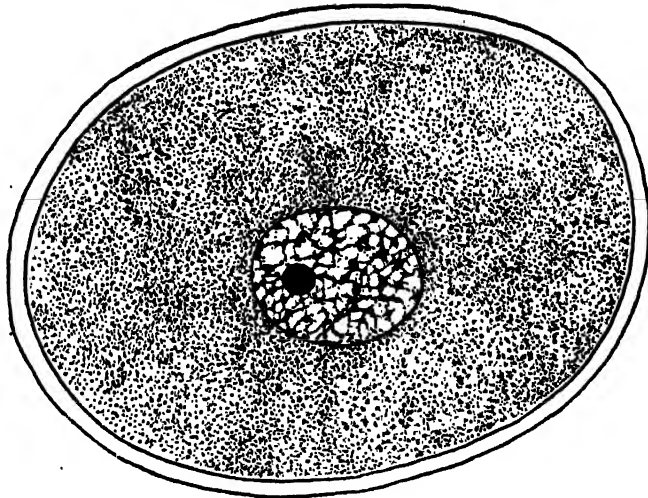
Primarily, the sexual instinct is Nature's provision for effecting the union of a special cell from the male body, the sperm cell, with a special cell from the female body, the ovum or egg—a process called fertilisation—whereby the development of a new individual is initiated. In its simplest form, as revealed in the lower animals, the sexual instinct is an inborn urge which impels animals of the opposite sex to approach each other at certain times, and to discharge their reproductive cells in such a way that fertilisation becomes possible.

In human beings the operation of the instinct is modified and complicated in varying degree by emotional and intellectual factors, but the nature of the instinct remains unchanged. As it is not until physical and mental growth are well advanced that the sexual instinct attains maturity, the influence of sentiments and ideals of conduct, acting by the instrument of *will*, in the interests of self and society, will control more or less effectually its crude and primitive exhibition.

Stimulation of the sexual instinct leads to a peculiar emotional excitement which forms an integral part of sex love but does not constitute it entirely, for sex love is a complex phenomenon embracing also the parental instinct with its protective impulse

SEX AND HEALTH

and tender emotion, and certain æsthetic sentiments. Indiscriminately aroused sexual emotion unrelated to the higher sentiments is properly referred to as "lust," and it may prompt yielding to the instinct in as unrefined and unforeseeing a manner as the mating of animals. The intimate connection of the sexual instinct with the parental is of obvious biological importance, for it secures the active co-operation of the father, first, in the care of the expectant mother and, later, in the care and upbringing of the offspring.



HUMAN EGG AND SPERM

The egg is seen surrounded by its membrane and containing the nucleus. The diagram is much magnified. The actual egg is $1/125$ in. across, and the sperm $1/500$ in. long.

It was long presumed that the sexual instinct was non-existent, or at least dormant, in children, and that the first manifestations appeared about the time of puberty, but the recent and remarkable investigations of Freud have revealed that the sexual life of the individual begins at birth. In early infancy the child's sexuality is concerned with deriving pleasure from sensory stimulation of certain body regions—the auto-erotic stage. Subsequently the child's interests are temporarily directed towards himself—a phase described as Narcissism, and this is followed by a love for those who are made as himself—the homosexual period. About the age of seven, certain tendencies, under favourable conditions or environment and training, check the crude sex impulses and cause them to pass into oblivion (latency period) until at puberty they increase in strength, and there is a marked consciousness of sex. According to Freud, over-development and exaggeration of one or other of these infantile sexual components will lead to sexual peculiarities in adult life.

An important aspect of the sexuality of childhood is the relationship of parent and child. As a rule, a preference is shown by the child for the love of the parent of

opposite sex. The son, for example, derives pleasure from the tender affection of his mother, and is apt to show resentment towards the father. Normally this antipathy is checked by the tender instinct of the parent and by the moral evolution of the child. Should the boy's mother-love be unduly encouraged by lavish care and caresses, the sex impulse tends to become fixed upon the mother, and this may render the youth unable to fall in love with a girl of his own age, or may lead to mental abnormalities in later life. This tendency, repressed in the unconscious, is termed the Oedipus Complex,* and Freud believes that it influences individual life in subtle and varied ways, and that it is the core of neurotic ailments.

Many people are reluctant to attribute any form of sexuality to the child, but it should be remembered that the child is unconscious of the significance of sex as it presents itself to the adult mind. Whether all children undergo the exact sexual evolution postulated by Freud may be doubtful, but there can be no question that the first glimmerings of sex life do appear in childhood,

In the classical Oedipus Myth, dramatised by Sophocles, Oedipus kills his father Laius and marries his mother Jocasta, in ignorance of their true identity.

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and that the child's future sexual life—with all it entails—is chiefly dependent upon the successful handling of this period by the parents.

Puberty is the period of bodily ripening when profound changes in the physiology and psychology of the organism manifest themselves. The birth of adolescence is shown in boys by increased growth of hair, enlargement

opposing gratification, profoundly influences the adolescent mind. Curiosity in sexual matters is reawakened, and enlightenment is sought from older youths—a happening not without danger.

In a spirit of experimentation the adolescent may manipulate the sexual organs in the desire to gratify the sexual impulse. Modern authorities state that this event is a normal occurrence of youth. At the same



YOUTH'S OUTLET FOR SEXUAL ENERGY

[A. Keystone]

The famous Eton Wall Game in progress—a typical example of the healthy games which help to guide the adolescent through a difficult period of sexual growth.

of the larynx, with alteration of the voice, and enlargement of the sexual organs; and in girls by increased size of the breasts, and the onset of menstruation. The internal secretions from certain ductless glands are instrumental in producing these changes.

It is at puberty that the sex instinct attains to maturity, and it is then that the conflict between the powerful instinct and the forces of tradition and social convention,

time a youth, healthy in mind and body, does not come under its influences to any harmful extent, and with the development of moral inhibitions in late adolescence this practice should cease. Fortunately at this phase of life, although there is a release of sexual energy, there are ways and means by which this energy gains an outlet, notably in school work, sport, exercise, and hobbies.

As puberty advances the adolescent com-

SEX AND HEALTH

mences to exhibit an interest in one of the opposite sex—at a distance—but later, in the case of the youth, he tends to become awkward and ashamed in the presence of girls and, by endeavouring to excel in sport, makes a bid for masculinity.

Because of the difficulties of sexual adaptation, adolescence is naturally a period of stress and conflict, and it must be emphasised that, upon the successful manoeuvring of its problems, the future well-being of the individual largely depends. Unfortunately the majority of adults, with strange forgetfulness, are oblivious to the dynamic upheavals taking place in the youthful mind, and, through lack of understanding, are unsympathetic to their reactions on the growing personality.

In manhood and womanhood the strength of sexual instinct is such that the desire for gratification becomes pressing. Most healthy adults "fall in love," and the crude sexual impulse is refined in the art of courtship. Human love is primarily an instinctive organic attraction to which are allied physical allurements, qualities of eyes, voice, and manner, and also mental charm—for love is an affair of body and mind.

In most societies, gratification of the sexual instinct is secured by marriage, the primary end of which is to procreate and bear offspring, and to rear them until they are able to take care of themselves. But there is a secondary function of the sexual intercourse of marriage: it should bring into being a perfect mental and bodily harmony between man and woman through a mutual sexual gratification. The sexual act is not to be regarded as a simple propagative episode, as in lower animals, but as the complex function which binds and links two human beings in reciprocated feeling. From this basic and essential sexual harmony will further develop intellectual, æsthetic, and moral unison. There will be a mutual expansion of their personalities, and the culmination of the sexual love will eventually find its most perfect realisation in the creation of new life.

Of the fundamental importance of the mutual adjustment of the sexual instinct in marriage, there can be no doubt. Failure will spell years of unhappiness, and may lead to nervous ailments, to infidelity, prostitution, and disease. Success will lead to a sublime happiness from which will develop parental emotion—the preparation for fatherhood and motherhood.

When, for economic or other reasons, marriage is impossible or delayed, certain sexual problems arise in adults.

Sexual Purity.

The sexual impulse is naturally strong, and the conditions of modern life tend to stimulate it, but the inhibitions, personal and social, in most cases hinder its gratification. The question immediately prompted is whether continence or sexual abstinence is harmful or not.

Opinion has varied greatly on this subject throughout the ages, but with our increased knowledge of physiology and psychology certain important guiding considerations have emerged. It is now clearly realised that the fundamental sexual energy can be elevated and transformed from a primitive to a highly developed complex form—a process now termed "sublimation." In literary and artistic compositions, and in the works of religion, sublimated sexuality plays a vital part.

While realising that the healthiest sexual state for an adult is to be secured by marriage, it can safely be asserted that no evil will accrue from sexual continence, provided there is adequate sublimation. True purity does not abolish sexual activity, but elevates it to the dignity of a creative force. Sexual self-denial will only lead to nervous disease when the erotic energy fails to find a natural outlet through sublimation. Chastity neither injures the sexual organs nor the sentiment of love.

In woman the cessation of menstruation at the climacteric or menopause marks the close of her reproductive life.

Warning of Sex.

Certain characteristic physical and mental changes occur at this time which are related to a considerable disturbance of the internal secretions. There is an associated waning of the sexual appetite,

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though in some cases this is delayed for some years. Occasionally the climacteric is preceded by a wave of increased sexuality.

In men there is no definite period of decline as a rule, though sometimes changes analogous to those occurring in women may arise initially between fifty and fifty-four. On the other hand, men of seventy and eighty have been known to retain all the sexual vigour of manhood, but these cases are exceptional. The waning of sexual desire after fifty must be regarded as normal; any attempt made to stimulate it artificially is unnatural and probably harmful.

A healthy sexual life is only to be achieved provided a high sexual ideal is conceived and lived up to; and this ideal must be founded on sound knowledge. The sexual lives of

future generations will be made or unmade by the present generation, which must realise its responsibilities in this direction, if the

welfare of the race is to be maintained or improved.

It has been indicated how important a rôle parents take in the development of their children's sexual instincts. With them rests the onus of sex enlightenment—an event for which wise parents will qualify themselves by a full understanding of the nature of sex and its problems. By a true sexual education the minds of children and adolescents will avoid accumulating the obscenities which make sex the object of lewd jests, and which lead to a degradation of what should be the noblest function of mind and body.

The sexual instinct, intertwined with the highest and most refined of human emotions and activities, with the technique of social intercourse, and with expression in the spheres of art and religion, must be neither

ignored nor depreciated, but must be given its true place if human beings are to attain satisfied, happy, and beautiful lives.



"LOVE AND LIFE"

[Photo, Frederick Hollyer]

From the famous painting by G. F. Watts, R.A.

SEX AND HEALTH

SEX AND HEREDITY

By MARY G. ADAMS, M.Sc., Tutor in Biology to the Cambridge University Board of Extra-Mural Studies.

HEREDITY is the flesh and blood relationship between one generation and the next. It is all the individual has by *nature*. That nature is played upon by the forces of *nurture* from the moment of fertilisation until death. Nurture—surroundings, education, occupation—may succeed in developing to the utmost the hereditary material with which it has to deal, or it may inhibit and waste in such a way that nature finds but sorry expression. But the individual, be he man or dog or star-fish, is the result of nurture acting on inherited nature. The forces of heredity and environment are not antagonistic; they are collaborators, both making their contribution to the physical and mental make-up of the creature.

To be healthy is, in the *first* instance, to be *well-born*, to have chosen sound and healthy parents; but health can only be maintained in a suitable environment, and even the constitutionally sound may succumb to some microbic disease from disregard of the laws of healthy living. On the other hand, those born with a legacy of weakness or instability may, by care, good fortune, or medical skill, become as healthy as those whose heritage of health has been squandered or ill-used. Vigour and weakness are both heritable—but both are subject to modification by circumstance. Unfortunately, this power of repairing, patching, supporting, developing, which the science and art of medicine have exploited to the full, has tended to obscure the fundamental importance of native, inborn fitness. *Acquired* health is not transmitted to the race. Unsound germ-plasm cannot be made sound in the course of a generation. Individuals are almost infinitely modifiable, but the race cannot be altered so easily.

Such a hard, uncomfortable doctrine requires elaboration. It must not be thought that healthy surroundings, clean wholesome food, sunny houses, and happy

recreation are of no account in securing racial fitness. They matter tremendously; they provide the good nurture which can bring out the best in our hereditary nature. But they operate indirectly. Our delight in personal health must not blind us to the necessity of securing racial health. We know by this time that some diseases are hereditary, while others are due to chance infection or to dangerous occupation. Diseases like measles, scarlet fever, diphtheria, malaria, smallpox, are not inherited; they are caused by a living microbe—and a microbe cannot be part of the inheritance. It is true that some microbic diseases apparently are inherited; tuberculosis and syphilis, for example. Both of these diseases throw light on disease inheritance. It is extremely rare that a tubercular mother infects, or has infected, her newly-born child. If the child develops the disease, as is often the case, it is due either to a congenital weakness and liability to the disease which the child receives as part of its inheritance from mother or father, or to the presence of unhealthy surroundings making infection probable. On the other hand, the syphilitic mother often infects her child before birth, and, owing to the nature of the disease, it is possible that the father actually carries the microbe to the mother's womb and causes infection of the developing child. This is contagion, not inheritance. On the whole, however, microbic diseases are not a menace to the inheritance of the race.

Some people appear to be *naturally* immune to certain of these diseases, and this valuable immunity is inherited. *Artificial* immunity, conferred by vaccines, antitoxins, and the like, is one of those acquirements, however, which is *not* passed on to the race, although it may be that the artificial immunisation of successive generations has the effect of lessening the incidence of the disease. Mr. Carr-Saunders, in speaking of *natura*

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selection in man, suggests that "it has been very largely concerned with the selection of disease-resisting (immunity) characteristics." So, too, epidemics are probably more fatal to the congenitally weak, and may, biologically speaking, cleanse the race. This may become increasingly important when the spread of sanitary and public health measures reduces the handicap at present placed on slum-dwellers and sedentary workers.

Malformations carry with them a heavy toll on infant life. In every million births, not counting still-borns, there are 2687 deaths in the first year from congenital malformation; still more infants can never be happy or useful because of inherited deformity. Many minor defects, like cleft-palate, hare-lip, colour-blindness, webbed

feet, club-foot, etc., are known to be inherited. Even short-sightedness, which is commonly attributed to bad lighting or over-strain, is more often due to an inborn peculiarity of lens structure. Short-sight runs in families. The eye is particularly susceptible to hereditary defect, but our recognition of the fact may be due to the ease with which modern conditions of civilisation "detect" such weaknesses. In more primitive conditions they might pass unnoticed. A hereditary disease is hæmophilia, or "bleeding": the hæmophilic person, nearly always a male, bleeds excessively, and may die after a slight cut. Asthma, gout, diabetes, "rheumatism," are all hereditary in the sense that there is a *predisposition* to the disease. The predisposition may be inhibited, by careful



THE ENVIRONMENT OF DISEASE

[Topical

Though environment, or *nurture*, cannot alter the individual's *nature*, it can exercise a definite influence for good or bad upon the future development of hereditary factors.

SEX AND HEALTH



[Courtesy]

[Cadbury Bros. Ltd.]

THE ENVIRONMENT OF HEALTH













Life in pleasant and healthy surroundings can do much towards modifying the effects of poor heredity.

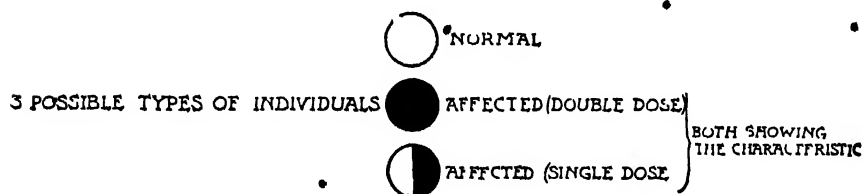
living, or its expression accelerated by irregularity, laziness, and indulgence. In reality, persons born with such "taints" have peculiarities of structure or function, as, for example, an excessively thin lining membrane in their lungs, or the manufacture of inadequate amounts of thyroxin; peculiarities which throw the whole organism "out of gear." One of the greatest difficulties with which physicians have to contend is the expression of weakness now as one disease, now as another. Weakness which shows itself as epilepsy in one generation may appear as suicidal insanity or alcoholism in another.

The most serious hereditary defects are the so-called "nervous" disorders—feeble-mindedness, idiocy, chorea, deaf-mutism, insanity, epilepsy, on the one hand, and alcoholism, criminality, prostitution, pauperism—on the other. They are all due in large measure to some defect of nervous mechanism and to subsequent lack of control. The cure for drunkenness is not prohibition, nor for vagrancy poor law; crimes of violence

will not diminish by reforming the prisoner, nor prostitution by providing "rescue homes." The farmer does not sow poor seed and expect a good harvest. Once born, our morality demands that the deaf-mute, the idiot, the syphilitic shall live, but painless sterilisation or segregation would prevent their reappearance on this earth. It is true that such "social surgery" would not remove all taints from posterity. Defects lie hidden in unsuspected places, masked by a veneer of health or by the accident of birth, and are liable to crop up when the right stimulus appears. But much could be done even in our present state of knowledge. The financial burden alone is intolerable and demands lightening if only for the sake of its dead weight upon the able-bodied. The family histories of mental hospital patients show clearly that there is an inheritance of a general, not a specific, predisposition to mental weakness. At least one-third of those confined in asylums have insane relations. The constitutionally sound retain their reason throughout the

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MATING		CHILDREN
1	 ×  NORMAL NORMAL	ALL NORMAL
2	 ×  NORMAL SINGLE DOSE	50% NORMAL 50% AFFECTED (SINGLE DOSE)
3	 ×  NORMAL DOUBLE DOSE	ALL AFFECTED (SINGLE DOSE)
4	 ×  SINGLE DOSE SINGLE DOSE	25% AFFECTED (DOUBLE DOSE) 50% AFFECTED (SINGLE DOSE) 25% FREE
5	 ×  SINGLE DOSE DOUBLE DOSE	50% AFFECTED (DOUBLE DOSE) 50% AFFECTED (SINGLE DOSE)
6	 ×  DOUBLE DOSE DOUBLE DOSE	ALL AFFECTED (DOUBLE DOSE)



THE INHERITANCE OF DISEASE

Chart showing how affected parents will transmit disease to their children.

greatest duress, a sudden shock or illness often proves too great a strain on weak material, and nervous breakdown results. Evolutionary biology can offer some explanation here. The nervous system is extremely complicated in backbone animals, the nerve cells are not capable of regeneration or repair—consequently there is a liability to instability after injury. Moreover, man's brain is a relatively recent acquisition; it is still plastic and liable to variation. It has not evolved as quickly as the artificial environment which puts so much strain upon it. It does not seem very odd, therefore, to find nervous disorders so common. It is well to remind ourselves that nervous abnormality is not always undesirable. Musicians, mathematicians,

the results perhaps are less striking, partly because the man of genius does not often choose a wife equally well-endowed, partly, too, because able women frequently eschew marriage. Moreover, genius in one age may be considered madness in another generation. The hereditary make-up of the child comes equally from both parents; unequal mating will therefore fail to make such a striking picture of the inheritance of talent.

Sir Francis Galton has collected, in *Hereditary Genius*, striking evidence of inherited ability. He shows, for instance, that of the 286 judges in England, between 1660 and 1865, 109 had eminent relations, and that the distribution of eminence among the relations was such that the nearer the

artists and poets, are often persons of extreme nervous sensitivity—they are the successful, valuable variations in nervous and endocrine mechanism.

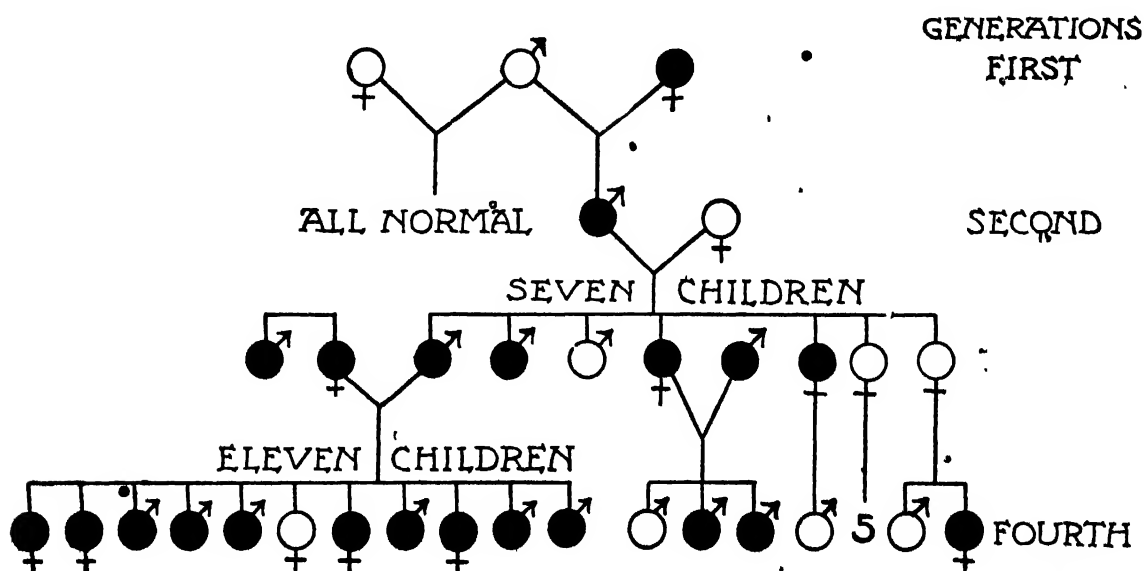
Feeble-mindedness is inherited; if two feeble-minded men marry, all their children will show the defect. It is curious that authority does not step in and prevent such propagation; for in such a case the feeble-minded condition is scientifically assured. Genius, ability, talent, is also inherited, but

SEX AND HEALTH

relationship the greater the percentage of eminent persons. There were 31 sons, 30 brothers, 22 fathers eminent in the first degree; 7 grandfathers, 9 uncles, 14 nephews, 11 grandsons eminent in the second degree; in the third degree there were only 11 persons. Similar investigations show that of the 46 men whose names are recorded in the American Hall of Fame, 26 had eminent close relatives. Galton also stressed the fact that, contrary to popular opinion, genius and ability are *generally* associated with mental stability, good physique, and energy. He was also able to discredit the stress which is commonly laid upon the effect of fortunate circumstances and education in producing and fostering genius.

Genius, in the past, has been drawn mostly from certain levels of society, from professional classes, and from families of sound social and financial status. Moreover, "to him that hath shall be given"; the child with a good equipment of intelligence profits by training, and takes advantage of opportunity, whereas the child which has not received such a valuable legacy fails to achieve as much on account of his inferior educability. Equalising opportunity does

not equalise achievements. Education underlines inequalities of heredity. A bad heredity *creates* a bad environment. People with energy and intelligence rise in the social scale, impoverishing the class from which they came. In the past, the "proletariat" has been further deteriorated by receiving failures from the classes above. It is true that many men and women have been suppressed by poverty and misfortune, but it is equally certain that these hidden Cromwells, Miltons, and Darwins are rare. We have not yet devised a social system which will seek out ability and encourage it; equality of opportunity has never been tried on a large scale. Until such a system has been tried, the environmentalists will have a case to plead. The need for such a system is now pressing. That is why of all the social reforms put forward at the present time few are perfectly sound from the biologist's point of view. *Free education* for all, rich as well as poor, women as well as men, should be followed by the recognition of ability, while measures designed to promote *public health* would provide the necessary physical background which alone will foster that ability. Such reforms would



A PEDIGREE OF FEEBLEMINDEDNESS

[After Goddard]

The marriage of a normal man with a normal woman in the first generation gives all normal children. His later mating with a feeble-minded woman (♀) produces a feeble-minded son (♂). His son has seven children by a normal wife: four of them are feeble-minded. Subsequent matings are shown in the fourth generation.

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seek out good hereditary material and encourage its development. This, after all, is but one of the functions of a state which cares for the future as well as the present welfare of its members.

In the examples we have given, showing the inheritance of healthfulness and disease, of ability and mental weakness,

Laws of Heredity

the natural equality of men is clearly exposed as a fallacy. Rights to political equality, to the pursuit of happiness, and to personal development, are matters outside our survey here. That men inherit differences, in spite of a basal "human" similarity, is obvious. There are racial differences, affecting pigmentation, hair, skeleton, temperament; family peculiarities, casts of features, disposition, trivial abnormalities; and sex characters, over-riding, modifying, and adjusting all the

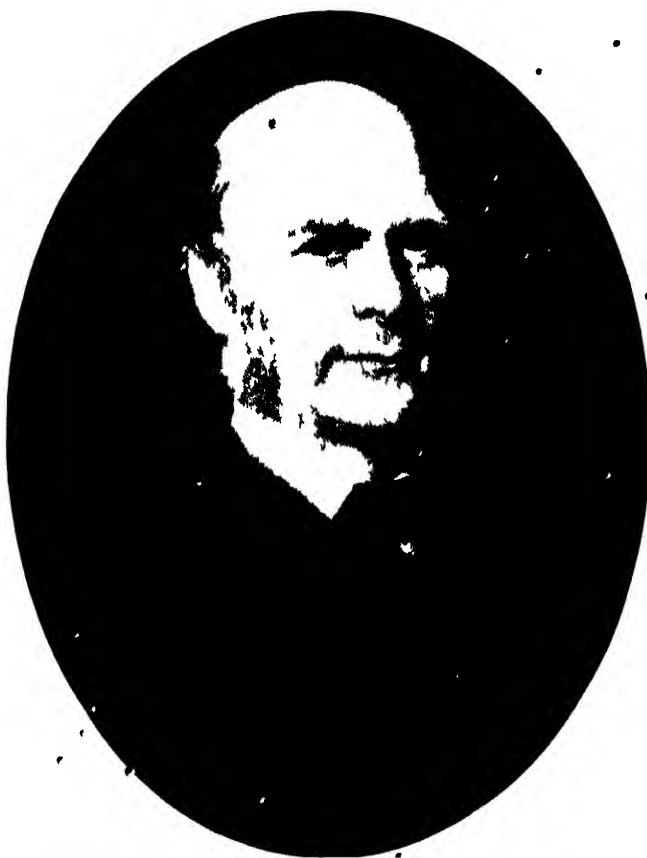
other inherited traits. In man so great is this inherited diversity that we are justified in saying that every individual is *unique*. But how are these differences, or variations, as they are called, transmitted from one generation to the next? There is clear evidence that good milking qualities are transmitted by the bull. How can this be explained? We can point to many cases where a characteristic has skipped a generation and yet appears unmodified in

the grandchildren. Certain traits are "carried" by a mother and transmitted to her sons only; they will not manifest themselves in female organisation. Such problems as these lie at the heart of modern research into the "laws of heredity." Heredity is a study of *how* variations are inherited. Clearly if the relationship be-

tween one generation and the next could be understood, the main problem of evolution would be solved. For heredity is part of the age-long process of becoming, which is evolution — a slow motion interlude in the lengthy film of evolution.

Francis Galton, Darwin's distinguished cousin, was among the first to study heredity scientifically. He applied mathematical methods and sought to get quantitative results. For example, if you know the height of the parents,

how tall, on the average, will the children be? Or, again, what percentage of able fathers beget able sons, and *how* able are the sons likely to be? As a result of his work, he proposed two laws. The first law of *Ancestral Inheritance* said that each child was a mosaic of his ancestors. Half of his inheritance came from his two parents (one-quarter each), one-quarter from his four grandparents (one-sixteenth each), one-eighth from his eight great-grandparents . . . and so on



From the *Painting* by

SIR FRANCIS GALTON (1822-1911)

[G. Graef

Darwin's distinguished cousin, who was among the first to study heredity scientifically

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the remote ancestors making a decreasingly small contribution.* The law has been found not to be strictly accurate, but it focuses attention on quantitative aspects, and stresses the equality of the contribution from male and female sides, and offers some explanation of the reappearance of characteristics borne by remote ancestors.

His second law of *Filial Regression* depends upon the first. It expresses the tendency to mediocrity everywhere observed. This stability, this inertia of large communities, enables us to describe an Anglo-Saxon type, an average American, and so on. The law states that on the average the gifted children of able parents are less brilliant than their parents; that the children of stupid parents are less commonplace; short parents have relatively taller children—in other words, there is a regression to the mean

or average of the population. Pearson has shown that if we take fathers of stature 72 in., the mean height of their sons is 70.8 in.; on the other hand, fathers with a height of 66 in. have sons with a mean height of 68.3 in. Nature is a great leveller. "It is this sturdy commonplaceness which enables the son of the degenerate father to escape the whole burden of the parental ill."

These laws express not only the funda-

* See diagram on p. 259.

mental conservatism and stability in populations, but they make possible quantitative predictions of what is likely to happen in the future. It must be remembered, however, that the laws refer to characters which blend; the alternative type of characteristic, blue eyes as against brown, for example, is largely outside Galton's laws. Nor must it

be thought that the laws are the negation of progress—they refer to populations in which no conscious attempt at selection, no preferential breeding, is being practised. Avenues of racial betterment, by the selection of "good" characters known to be inherited, or by the rejection of "bad" characters, are opened up by the discovery that Mendel's laws apply to man as well as to plants and guinea-pigs and flies.

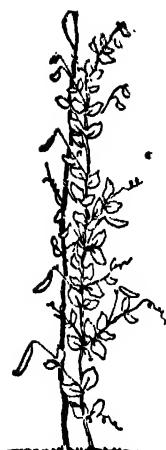
Gregor Mendel was an Austrian monk. Mendel. "Untroubled



GREGOR MENDEL (1822-1884)

The Abbot of Brunn, whose simple experiments on the breeding of peas revolutionised our knowledge of inherited characteristics.

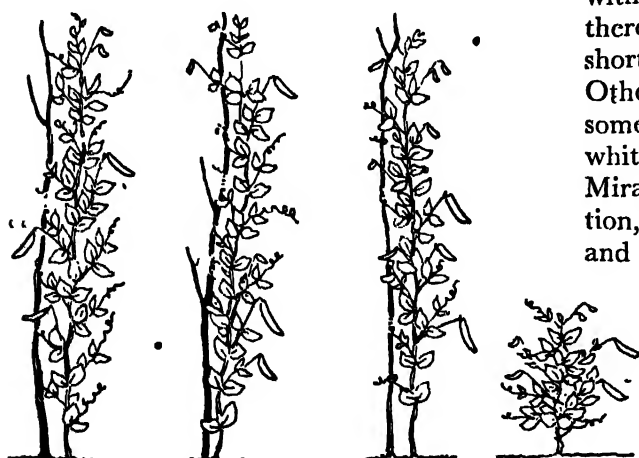
by the itch to make potatoes larger or bread cheaper," he devoted his life to breeding peas. While Darwin became famous, Mendel worked and died in obscurity, and his discovery, published in 1866, was not known to the world until 1900. During the quarter of a century which has elapsed since then the world has been busy raising a monument to Mendel—a monument of facts which have emphasised the epoch-making nature of his work.



FIRST GENERATION



SECOND GENERATION



THIRD GENERATION

MENDELIAN INHERITANCE IN PEAS

The results shown here, and described on this page, have been found to apply to many traits in plants, animals, and human beings.

All scientific progress is based on advances in method and technique. Darwin could not use hormones (the secretions of the ductless glands) and chromosomes (the bearers of hereditary characteristics) to enlarge his horizon, because knowledge of such things waited on the advent of physico-chemical methods and powerful microscopes. Mendel's experiments on peas were very simple, as the best work usually is. He thought of individuals as built up of a host of single characters—factors we now call them. Man,

for example, has height, weight, hair colour, form, length, eye colour, strength, and the whole gamut of mental and physical characteristics. Mendel took two parent peas and decided to trace the descent of *one* character only. He took a pure tall parent and a pure short parent, crossed them, collected and sowed the seeds, and examined the grown-up seedlings to find out if they were tall or short. They were all *tall*. He then used these tall peas as parents, selfed them, and again examined their offspring for height. Of the hundreds of plants which he had sowed, he found that three-quarters were tall and one-quarter were short. Clearly, shortness had skipped a generation, but had not been lost. He pursued the matter still further by "selfing" all the tall and all the short in this third generation; the shorts only gave shorts, generation after generation, but the tall gave tall and short in the same proportion as before—three tall to one short. A glance at the accompanying diagram will make the situation clear.

Mendel tried many other "unit factors"—seed coat colour (green or yellow), flower colour (purple or white), seed shape (round or wrinkled), and found that the law held good. In other words, he could "predict" the characteristics of the offspring when the characteristics of the parents were known with certainty. In the cases he investigated there was dominance—tall dominated over shortness (but could not suppress it entirely). Other workers have shown that factors sometimes "blend," e.g. the offspring of a white crossed by a red petaled flower—*Mirabilis*—are all *pink*. In the next generation, however, we find one red, two pinks, and one white; of these the reds and the whites go on always giving reds and whites respectively; the pinks split up, as you would expect, into reds, whites, and pinks in the same proportions as before. The pink-coloured flowers are called hybrids—the result of mating parents with different characteristics. The second generation of tall peas were hybrids, too, although they looked like their pure

SEX AND HEALTH

tall parents. The test for hybrid blood is *breeding*. Breeding will reveal mixed blood and bring out hidden characteristics.

Mendelism explains many things—why two pure blue-eyed parents can only have blue-eyed children; why brown eye pigment (which is dominant over blue) is becoming more widely spread in our population; why all the children of two deaf-mutes are deaf-mutes; why the sexes are approximately equal in all animals where the sexes are distinct. About sixty human traits (many of them abnormal) have been listed, which seem to be inherited in Mendelian fashion. But few human characters alternate so sharply as the examples given above. Complications are introduced; there are gradations of height, weight, colour, and modifications due to age, sex, or circumstance obscure the issue. A few characteristics, however, conform exactly—for instance, human blood belongs to four different types (important distinctions in blood transfusions); these four types are inherited simply and exactly along Mendelian lines. We shall probably find many more such characters in the forthcoming “age of biochemistry.” Mendelian “prediction” will become an exact science. As it is, “Mendel’s principles of heredity have served as the thread of Ariadne to guide science through this maze of apparent contradictions and exceptions in which it was formerly lost.”

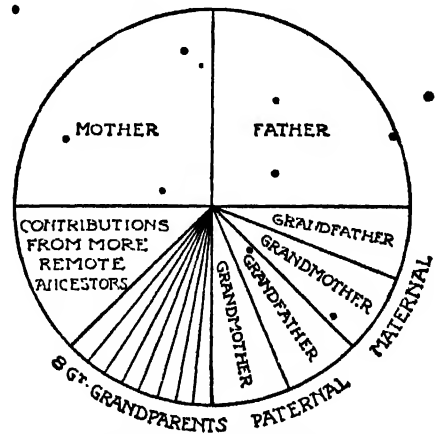
LIST OF CERTAIN ABNORMALITIES KNOWN TO BE INHERITED *

<i>d</i> —dominant.	<i>r</i> —recessive.	
Achondroplasia		<i>d</i> (?)
Adenoid disposition		<i>d</i>
Adiposity		<i>d</i>
Arteriosclerosis		<i>d</i>
Asthma		<i>d</i>
Astigmatism		<i>d</i>
Baldness (early)	(limited to males)	<i>d</i>
Cataract		<i>d</i>
Chorea		<i>d</i>
Cleft palate	(irregular)	<i>d</i>
Club-foot		<i>r</i>
Cretinism		<i>r</i>
Deaf-mutism		<i>r</i>
Dementia praecox	(many factors)	<i>r</i>
Diabetes mellitus	(irregular)	<i>r</i>
Diabetes insipidus		<i>d</i>

Elephantiasis		<i>d</i>
Enuresis nocturnal		<i>r</i> (?)
Epilepsy		<i>d</i>
Feeble-mindedness		<i>r</i> (<i>d</i>)
Flat foot		<i>d</i>
Freckles		<i>d</i>
Gall-stones		<i>d</i>
Glaucoma	(or <i>r</i> sometimes)	<i>d</i>
Glycosuria (severe)		<i>r</i>
Gout	(irregular)	<i>d</i>
Haemophilia	(sex-linked)	<i>r</i>
Hare-lip	(irregular)	<i>d</i>
Hay fever		<i>d</i>
High blood-pressure		<i>d</i>
Hirschsprung’s disease		<i>d</i>
Hypothyroidism		<i>d</i>
Hysteria		<i>d</i>
Inguinal hernia		<i>d</i>
Insanity (maniac depressive)		<i>d</i>
Microcephaly		<i>r</i>
Migraine	(sex-linked)	<i>d</i>
Myopia (short sight)	(sometimes <i>d</i>)	<i>r</i>
Neurasthenia		<i>d</i>
Nystagmus		<i>d</i>
Pernicious anaemia		<i>d</i> (?)
Stammering	(irregular)	<i>d</i>
Suicide		<i>d</i>
Valvular disease of the heart		<i>d</i>

THE MACHINERY OF HEREDITY.

Mendel’s explanation of his “laws” is the bedrock upon which modern research in genetics is founded. Mendel knew very little about cells, nothing about chromosomes, yet from the results of his breeding experiments he predicted that a certain mechanism must exist in the sex-cells of his peas. He described that mechanism in detail, although he could not prove it existed. He knew that all the

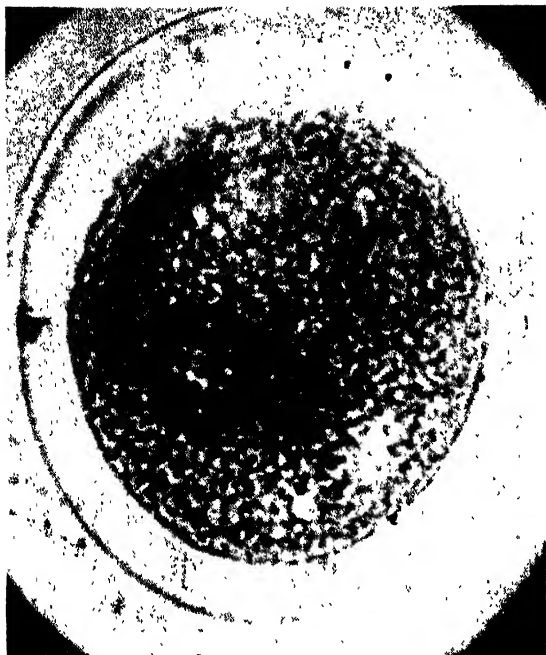


OUR HEREDITARY “MAKE-UP”

A diagram illustrating the Law of Ancestral Inheritance, which defines the proportions in which characteristics are inherited from parents and earlier ancestors.

* From *Organic Inheritance in Man*, by F. A. E. Crew.

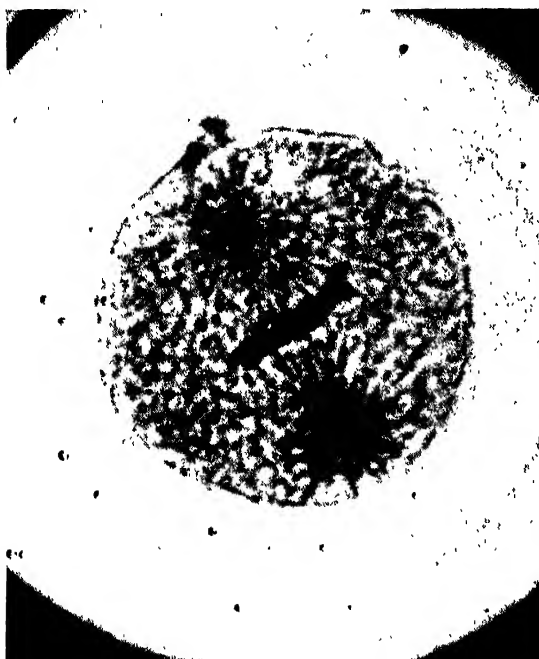
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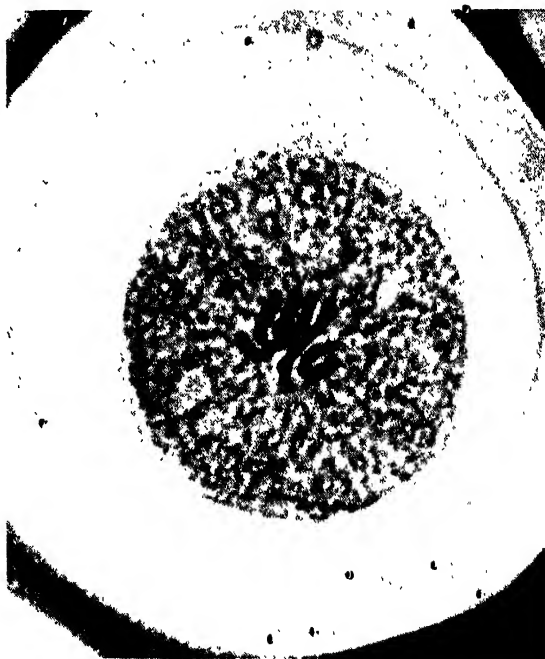
I.



II.



III.



IV.

[Courtesy]

[*"Animal Biology,"* by Haldane & Huxley (O.U.P.)

FERTILISATION: A DRAMATIC MOMENT IN HEREDITY

The photographs on these pages show the actual splitting-up of a single cell to form two separate cells, each complete in itself. They are taken from untouched microphotographs by D. A. Kempson of the fertilised egg of a round worm found in the intestines of the horse. Each cell possesses two pairs of chromosomes.

- I. Shows the unfertilised egg, with nucleus in the "resting" phase.
- II. Fertilisation has just taken place, and the nuclei of egg and sperm are approaching each other. Notice that the chromosomes are appearing.
- III. A side view of the first sign of division. Two "poles" have appeared, and the chromosomes are arranged round the "equator."
- IV. An end view of the same stage, with the four chromosomes clearly visible.

SEX AND HEALTH



V.



VI.



VII.



VIII.

[Courtesy]

[*"Animal Biology,"* by Haldane & Huxley (O.U.P.)

THE FIRST DIVISION AFTER FERTILISATION

The egg in each case is lying within a thick, transparent egg-membrane or shell. For the purpose of these photographs a microscope was used which magnified 750 times for all except V., and 1000 times for V.

- V. A side view of a slightly later stage. Each chromosome is splitting longitudinally.
 VII. Here the egg has completely divided into two cells, and in each the chromosomes have joined up. The nuclei are now at the "resting" stage again.

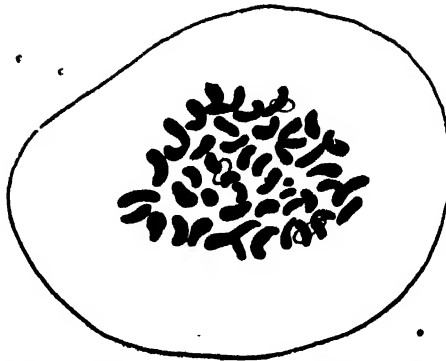
- VI. The two sets of chromosomes have moved apart towards the "poles," and the cell is beginning to constrict.
 VIII. Another cleavage has begun, and four chromosomes can already be clearly distinguished in the upper cell.

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characteristics (unit factors) of the adult must be contained in the sex-cells which form the bridge between one generation and the next. Clearly, height, colour, or size cannot in themselves be present in those microscopic sex-cells; something must represent them there, something which in the course of bodily development grows into colour or size or weight. Mendel said that the sex-cells contained

"units," "somethings," which represented adult characteristics. Modern biologists call them *genes*. Genes pass unchanged from parent to offspring; they are persistent, eternal. They need not necessarily show themselves as adult characters in any particular generation, they may remain hidden, masked, until the laws of chance bring about their reappearance in a later generation. During the last quarter of a century investigations carried out on the sex-cells of animals and plants have revealed just such a mechanism as Mendel prophesied. Genes are real things, not convenient abstractions; they have size, position, behaviour.

In cell division there exists a precise mechanism whereby the nucleus—the "brain" of the cell—splits into a number of rod-like bodies, the chromosomes, in order to ensure accurate division into two cells.



After Painter]

[*"Journal of Experimental Zoology,"* 37 (1923)]

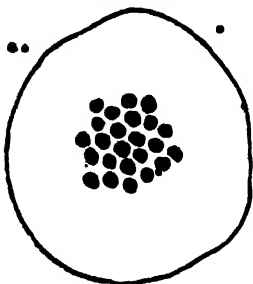
CHROMOSOMES IN MAN

Diagram of a human cell, magnified about 3000 diameters, showing the chromosomes which carry the hereditary characteristics.

The nucleus of the sex-cell, male or female, is made up of sets of chromosomes. Chromosomes; in fact, the bridge between parents and child is a set of chromosomes contained in the egg from the mother, and a similar set contained in the sperm from the father. Somehow or another, therefore, the hereditary factors must be contained in the chromosomes. There is abundant evidence that

the factors or genes are contained in the chromosomes. By an elaborate technique, chromosomes have been "mapped," and the relative position of the genes along the chromosomes ascertained. Chromosomes and their hundreds—possibly thousands—of containing genes are extremely minute. A chromosome has to be highly magnified before it can be seen at all; genes are probably clusters of molecules lying like beads along the length of the chromosome. The chromosomes of hundreds of plants and animals have been examined, and the chromosome mechanism of heredity has been found to have widespread application.

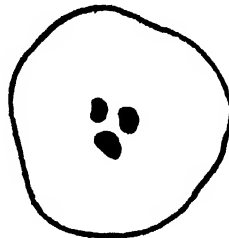
The chromosomes of man are very difficult to investigate. It seems clear, however, that each cell of the female body has 48 chromosomes. The number 48 is of no special significance; many kinds of



POTATO
X = 24



ANEMONE
X = 8



GREENFLY
X = 3



CHICKEN
X = 36

PLANT AND ANIMAL CHROMOSOMES

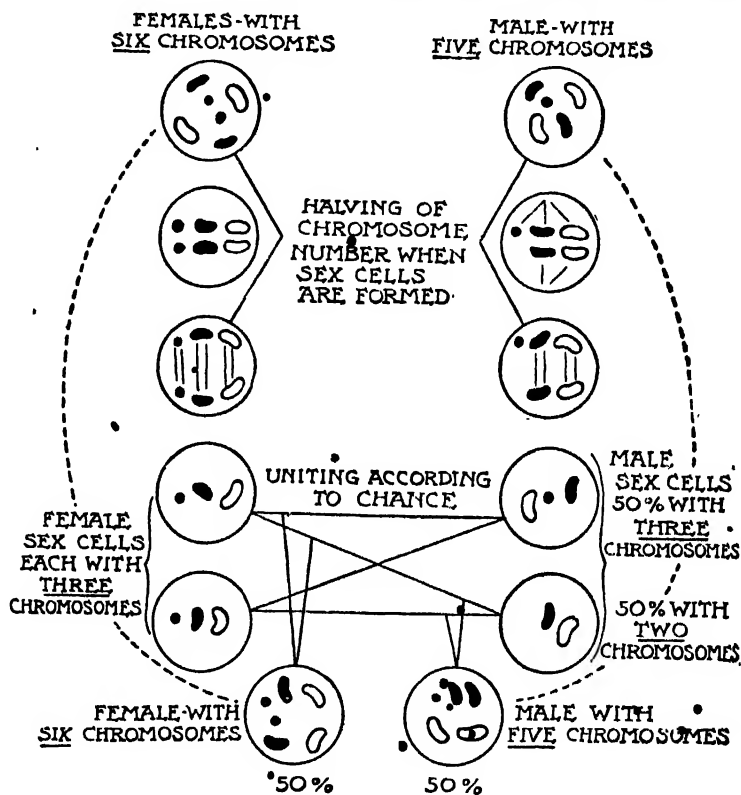
"X" denotes the number of chromosomes in a single sex-cell.

SEX AND HEALTH

plants and other animals have this number. Sexual reproduction, however, involves a constant doubling of chromosome number when the union of sperm and egg takes place. A contribution of 24 chromosomes from the male uniting with a similar 24 from the female would give 48; if this happened in each generation there would soon be no end to chromosomes. It is clear that provision must exist for some reduction in chromosome number. Once again theoretical consideration preceded practical demonstration. A search revealed the necessary reduction division; once in the life of the individual the chromosomes are reduced by half; 48 becomes 24. This takes place when the sex-cells are formed. Thus a very wonderful mechanism exists whereby the chromosomes, doubled in sex fusion, are halved when the sex-cells are formed. Moreover, this reduction division provides just the machinery Mendelism demands for the distribution of factors in the sex-cells. The laws governing the revolutions of the planets are not more precise than those bringing about Mendelian segregation and reconstruction in the tiny universe of the cell. Chromosome mechanism is the most complicated thing known to science.

Naturally our human interest in genes prompts the question—Can these genes which carry the hereditary factors from generation to generation be modified in any way? The answer waits on time. Much experimental work is being done; attempts are being made to remove chromosomes from the cell, and consequently from the inheritance. But this means removing many hundreds of genes from participating

in development, some of which may be essential to proper growth. Greater chance of success lies in finding some chemical substance which will have a *specific* effect on certain genes, narcotising or destroying them. Or perhaps ultra-violet rays could be focused upon particular genes. In America, Müller has subjected the sex-cells of flies to X-rays, with the result that many



SEX DETERMINATION BY CHROMOSOME NUMBER

In this example males have one less chromosome in the body-cells, so at reduction division half their sex-cells contain three chromosomes and half contain only two. All the female sex-cells contain three chromosomes. The union of these by chance gives males with five, females with six, in equal numbers. The small black chromosomes are those concerned in sex determination.

new and surprising variations have turned up in the progeny—some of which proved harmful to their possessors, and none of the new departures seemed valuable and useful. The most straightforward line of advance at the present time seems to be the possibility of combining "good" genes known to be present in different individuals. One may be able by this means, as Mr. Haldane says, "to bring off a really brilliant com-

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'bination" as a result of the mating of two valuable streams of germ plasm. Such match-making can be made on paper at the present time; there is no reason to suppose that it will not become practical politics when health and good heredity as well as love become fashionable as marriage incentives.

DETERMINATION OF SEX

So much that is inaccurate and misleading has been written and

spoken
Can we control Sex? about sex-determination that

few people realise the great strides that have been taken in recent years towards a basic understanding of the problem. That is not to suggest that sex can be controlled or determined by means of the knowledge we possess at present. It is true that this has been done in certain lowly species — in moths, frogs, and pigeons, but control in mammals still eludes complete understanding. Superstitious ignorance and coincidence have given credence to many odd theories:

there is a fairly widespread notion that one ovary produces male eggs and the other female eggs, though removal of one ovary completely disproves this. Some think that the strong prepotent partner impresses the sex upon the majority of the children born. Many mothers believe they can determine the sex of their child by exerting will or imagination, if not by diet and habit during pregnancy. Belief in the effect of diet has some justification, perhaps: male rats fed

on a diet deficient in vitamin B produce litters containing an excess of females. It has now been established that vitamin E has an effect on fertility; in fact, the accessory food factors (vitamins) are clearly implicated in the control of certain physiological states in the mammalian body. Nevertheless, such control is only "indirect."

Any *direct* method of sex-determination must be based on an understanding of the chromosome mechanism. In the last section

it was stated that in any one species of plant or animal there is in every cell of the body a certain number of *chromosomes*, bodies now known to contain the hereditary characteristics. The sex-cells, eggs and sperms, contain half the number of chromosomes present in the body cells of the species. It has been found, however, that in a large number of animals the male has one less chromosome in each cell of his body. Man, for example, has 47 chromosomes in each cell; woman 48. The chromosome number is halved when the sex-cells are formed; therefore, although



[W. S. Berridge

MALE AND FEMALE IN ONE

A giant snail which is hermaphrodite, i.e. which possesses both male and female organs.

all the eggs of the female contain 24 chromosomes, the sperms of the male are of two kinds, half of them having 24, and half 23. From the diagram on page 263 it can be seen that random fertilisation of eggs and sperms will bring about the production of approximately equal numbers of female embryos and male embryos.

Thus it is clear that the *male* in man determines sex. If a sperm containing 24 chromosomes succeeds in penetrating the

SEX AND HEALTH



(Newman, Berkhamsted)

A RESULT OF CROSS-BREEDING

This cross between a zebra and a horse shows clearly the blending of the characteristics of each.

chemical means, and thus to bring about the birth of females rather than males. Careful microscopic examination has shown that the sperms in certain mammals are of two sizes, therefore the next step must be to aim at finding conditions which affect the two classes of sperms differentially. Therein lies the possibility of sex-determination.

A question of popular interest clearly bound up with this problem of sex-determination is the presence in our population of more women than men.

How does this happen, if, according to the chromosome explanation, males and females are produced in approximately equal numbers? The facts are instructive: it has been found that the number of males to 100 females at conception is about 130. This excess of males drops down to about 103 to 106 at birth. After four

egg, a female will be the result; but if the successful sperm has 23 chromo-

somes a male will be formed. Any attempt to control sex, therefore, must aim at one of two things: (1) Modifying the normal 50:50 ratio by which equal numbers of male and female producing sperms are formed. If, for example, more sperms containing 24 chromosomes (female determining) could be induced to form or survive, then clearly more girls could be born; (2) Influencing the behaviour of the sperms so that only sperms of known composition would succeed in effecting fertilisation. Suppose, for example, it were to be found that the sperms containing 23 chromosomes were less robust than those with 24, it might be possible to hinder their progress towards the egg by some



(Newman, Berkhamsted)

A SHIRE STALLION

This well-known breed of horses is the result of long and careful in-breeding to stabilise the desired characteristics of strength and weight.

or five years the sexes are approximately equal; throughout mature life females are in excess. It is clear that a large number of extra males are got rid of, either before birth, by abortion, resorption, or still-birth, or after birth by a greater delicacy leading to more frequent death in early childhood. It is well known that the greater number of still-births and miscarriages are of male children; it is also a matter of common experience that boy babies are more difficult to rear than girl babies. Baby welfare and maternity care has succeeded in reducing the infant mortality in a striking way, but still there seems a point beyond which we cannot go. The infant death-rate during the first month of life has remained fairly constant for several years past. It appears that a certain proportion of the babies born *must* die, and that of those who die, most are boys.

SOME COMMON MISUNDERSTANDINGS

It is a time-honoured belief that the unborn child can be affected by the strong emotions or sense impressions of the mother. A woman whose child is born with hare-

lip remembers how she was
Maternal Impressions.
 frightened by the sudden appearance of a hare-lipped man

when she carried the child; intense desire or deliberate "willing" that a boy should be born has had the desired effect; mental stress and agony have resulted in a feeble-witted child—there are many such old wives' tales. Modern science, however, can discredit most of them by reference to simple developmental and physiological facts, or by statistical evidence showing how often fears and anticipations have *not* been realised. For instance, most structural defects are determined in the early weeks of pregnancy, yet malformations and deformities are often attributed to events which took place during the last months of development. An experiment made by a famous doctor at a lying-in hospital is also reassuring: he carefully inquired of the women about to become mothers whether they anticipated any special feature in their child likely to be caused by

impressions during pregnancy. In no instance was their expectation realised. It is admitted, of course, that the general health and diet of the mother may react upon the child, causing it to be born weak or strong—but that is a different matter.

It has been suggested that if a female mates with two males, her offspring by the second mate may bear some of the characteristics of the first mate—"Tele-gony."

in other words, the female has been "contaminated" by the first mating. This belief is common among breeders of dogs and horses, and cases were even cited by Darwin. Many breeders believe that a mongrel will contaminate the offspring of a pure-bred, after her mating with a similar pure-bred male. Herbert Spencer quotes the experience of a white woman who had intercourse with a negro, and afterwards married a white man: her legitimate children were said to possess some negro characteristics. Many of the supposed instances of this "tele-gony" could be discredited if more information could be obtained concerning the heredity of the individuals concerned. We know that factors concealed in the sex-cells may show themselves by suitable mating. Moreover, accurate information is very difficult to get. Scientific scepticism, however, is based primarily on the absence of any known method by which such transmission could be effected.

The same difficulty holds in speculations on the inheritance of acquired characteristics. Enough has already been said to make it clear that the general consensus of biological opinion is against the belief that changes induced by the environment of the growing individual can become fixed in its hereditary constitution in such a way that they reappear in subsequent generations without the stimulus that originally induced them. It is obvious that a similar environment is likely to call forth the same adaptive changes—but this is not inheritance. The descendants of an animal whose skin changes colour when its environment is altered are likely to practise the same pro-

SEX AND HEALTH

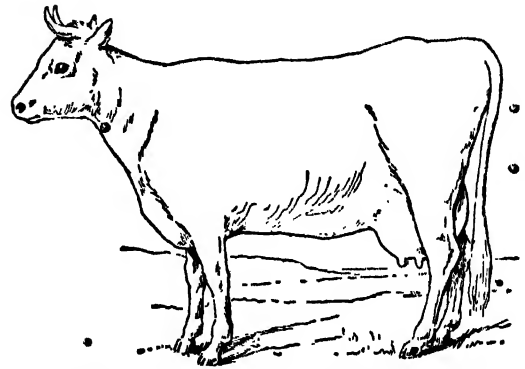
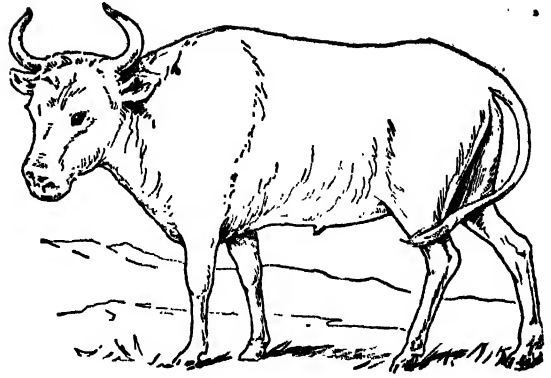
fective device when similar conditions demand it.

There have been a number of biological experiments designed to test the effect of in-breeding and out-breeding. In

Breeding Experiments. nature many plants and hermaphrodite animals are habitually "inbred" without evil effects.

Experimental in-breeding shows that healthy stock can be secured by this means, *provided that* there is a judicious elimination of undesirables. In fact, many important breeds of cattle, horses, and dogs have been stabilised by in-breeding. If pushed too far, however, prolonged in-breeding may lead to reduction in vigour, fecundity, size, or disease resistance. The value of out-breeding (which finds its expression in our own laws prohibiting marriage between near kin) contrasts with the danger of in-breeding; it promotes vigour in the offspring of a fairly wide cross, and brings about a greater variability in the characteristics of the children. Evolution depends on this variability, and it is obvious that in the course of evolution out-breeding was probably followed by periods of isolation, during which in-breeding stabilised the selected variations. As Professor J. Arthur Thomson has said: "'Breed in' is one policy; secure that which is good. 'Breed out' is the other policy; pool the gains of the ages."

The biological viewpoint may also help us when we are confronted with the modern problems of racial mixture. **Race Mixture.** Barriers of all kinds—geographical, religious, social—are breaking down; it is not an exaggeration to foresee a time when there will be far less racial distinctiveness than there is at the present time. Mankind consists of a single species; as far as we know, the widest possible human crosses are fertile, and the offspring of such crosses are not lacking in vigour, size, or reproductive capacity. If the two races are sound, their inter-breeding should not lead to feebleness or degeneration. The Anglo-Polynesian hybrids of the Pitcairn and Norfolk Islands are described as healthy and prolific; the Boer-Hottentot combina-



GOOD EFFECTS OF IN-BREEDING

Diagrams showing how domestic cattle have been improved by breeding, increasing their usefulness to man.

tion in South-West Africa have received favourable comment; historical examples of Greek and barbarian matings produced good stock. Unfortunately, however, in modern times, individuals mating out of their race have not possessed the best heritage of their own stocks: it is not unnatural that their children, inheriting the inferior qualities of both races, should themselves be enfeebled. It is an exaggeration to say, however, that the half-breed has the vices of both races and the virtues of neither. Wide racial crosses unsettle the foundations of racial culture, and the children are likely to become social outcasts in an intolerant milieu.

That is no reason, however, for condemning the cross on biological grounds.

Racial Crossing. The mixture of white races can be looked upon with equanimity, since most European peoples are already the product of many strains. Eng-

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lish, French, German, Austrian, have a dozen racial stocks in their inheritance. Their differences are social rather than biological; and even their cultural differences are of comparatively recent development. On the other hand, the intermarriage of distinct races, such as Negro and White, Mongol and White, Indian and Negro, is a more risky experiment. Mulattoes are generally credited with a relatively weak physique, but intellectually there is abundant evidence that they are superior to the negro. Little is known of the second generation of racial crosses, and generalisations based on first generation hybrids are not of much value in estimating the effect of race mixture in the future. It can only be suggested that indiscriminate crossing cannot be encouraged until more extensive and unprejudiced studies have been made. At present, immigration and emigration laws are political conveniences; we need more knowledge to enable them to be based on sound biology.

POPULATION PROBLEMS

The paradox of the population problems lies in this, that in the past increasing numbers have been an extremely important factor in progressive Eugenics. evolution, making possible division of labour, co-operation, and integrative life on a higher level of organisation, whereas at the present time a continued increase in world population holds menacing possibilities of wars, famines, and a general decline in standards of living. The famous biologist, William Bateson, declared that "the declining birth-rate was one of the most promising omens which exist for the happiness of future generations." Certainly the declining birth-rate is as much welcomed by biologists as it is deplored by politicians.

At present the population of the globe is about 1700 millions, increasing at the rate of about 15 millions a year. There have been many predictions that the population would outrun the food supply and that a natural decline in numbers would result

from pressure on the means of subsistence. Such a doctrine of pessimism, however, seems unjustified by the probable results of scientific research. New discoveries may create new adjustments; new sources of power may supplement existing supplies of coal and oil; new agricultural methods, exploitation of fisheries, biochemistry, new economies in diet—all these things open up immense possibilities of increasing the food supply. The scientific revolution may, in fact, impose an entirely new outlook upon population pressure.

The present facts, however, are serious enough: the birth-rate is declining; this country has experienced a steady Birth-rate decline since 1877, but this beneficial decline is accompanied by disturbing features. It is lowest in that section of our population which, according to modern standards, is more socially desirable; highest in the more thoughtless, unskilled, ignorant classes. In 1881, the birth-rate in two contrasted boroughs in London—Hampstead and Shoreditch—was approximately equal; to-day the birth-rate of Hampstead is about half that of Shoreditch. It is self-evident that the people who live in Hampstead are not all desirable citizens, and that many slum dwellers in Shoreditch make valuable contributions to the race, but on the whole it is true that the attainment of a high standard of living and education is some evidence of civic worth, while slum conditions, casual labour, and poor physique are evidences of less valuable hereditary material.

Naturally, such a statement needs exploration by those to whom it is unpleasant and reactionary; few biologists can make it without being severely criticised by those who believe that environment and opportunity matter more than heredity. Few would deny, however, that the high birth-rate of the unskilled, as against the skilled, classes is an undesirable state of affairs. Ability appears to be hereditary, yet figures show that skilled workers average (in America) seven-tenths of a son apiece, while the families of casual labourers

SEX AND HEALTH



[Topical

THE PERIL OF OVERPOPULATION

Children are born into this slum environment at about twice the rate at which they are born among healthier surroundings.

average between four and five children. Future generations are therefore being recruited from the ill-equipped, rather than from the well-equipped, section of the community.

The reasons for this are not hard to seek—a high standard of living and more exacting educational preparation demand late marriages and birth control; children become an economic luxury. The small size of the modern “professional” family has many advantages over the large inconsequent brood raised by nineteenth-century parents—the health of the mother is improved; the family resources are not drained; children are healthier and better cared for. The emancipation of woman is bound up with the voluntary control of parenthood. Artificial methods of birth control are becoming more widely used, but there is grave danger in the present practice of confining knowledge of such

methods to certain sections of the community. Up to the present time, wealth and education have had access to information denied to poverty and ignorance. Only when this knowledge is disseminated amongst the classes which most need it can we begin to regard its application as entirely desirable from a biological point of view.

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THE HYGIENE OF MARRIAGE .

By *BARBARA CRAWFORD, M.B.E., M.B., Ch.B., formerly Senior Resident Medical Officer at the Borough Isolation Hospital and Sanatorium, Leicester.*

MARRIAGE is the normal state for the healthy adult man or woman. Without it, life is incomplete as regards experience, development, and responsibility. All normally constituted young women look forward to being married—and so do all normal young men ; and, during the years of adolescence, the thought of the mate that the future will bring is seldom altogether absent from the background of their minds. This does not mean that they are ready to marry any one who takes their fancy. The more civilised we become, the more fastidious are we in this all-important matter of mating. The partner must be congenial and suitable as a companion and helper, mentally and morally as well as physically.

Marriage is the most important voluntary step in the lives of most of us, and the choice, once made, can only be revoked with difficulty. It involves very great responsibility both for ourselves and for the race, and should not be undertaken lightly or in ignorance. Among a certain section of to-day's progressives, permanency in marriage is decried, and easy separation or divorce is advocated if either party so desire. This is no new idea ; it always has been advocated by those who would enjoy without responsibility and always will be, but the essential fact remains that legal marriage is an institution for the protection of women and children, of motherhood, and only the very exceptional woman can afford to dispense with the security the bond gives her. Marriage for most women means motherhood, and, Nature having laid practically the entire burden of human reproduction upon woman—and it is no light one—marriage as a social and legal institution enables man to share some of this burden with her.

In wild life the female can support herself while she bears and rears her young ; but

the multitudinous demands of civilisation make it impossible for a human mother to do justice to her special task and Parents earn her own and her children's and Home. living at the same time. The human infant is more helpless, and has a longer period of dependence than the young of any other creature. This long immaturity, while allowing that great development of the human brain and mental faculties which distinguishes man from other forms of animal life, makes necessary the combined care of both parents and the shelter of a settled home.

The ordinary woman, therefore, requires the protection of a home and a husband during the years when her children are young and need her constant care. If, later on, she could be easily discarded for a fresher and more attractive partner, it would raise social problems which the boldest innovator could hardly solve. Who can hear unmoved of the struggles and difficulties of the ex-service men who found it all but impossible to gain places once more in civil life on their return from an absence of five years or less at the Great War ? Just think what the difficulties of women would be if, after devoting the best years of their youth and strength to wifehood and homemaking, they had to step out into the world again, and compete—with no societies or Poppy Days to help them—with girls and women ten or twenty years younger, to take up a forgotten routine, to beg for the opening given up years ago in office, school, or shop !

It must not be forgotten that if a man works to provide the home, the woman gives up her livelihood outside the home to work in it, and she is entitled to her full share on that account. If she has children, as most married women do, her work has been the harder, and to expect her to start again to earn her living at a new occupation elsewhere when her best years are gone is nothing but cruel nonsense.

SEX AND HEALTH



CUPID AND PSYCHE

[Brogi]

Canova's interpretation of one of the most beautiful love stories in classical mythology. (In the Villa Carlotta at Tremezzo, Lake Como.)

As marriage under present social conditions must necessarily be permanent, surely we should do our best to give it a fair chance of success by avoiding, as far as we can, certain pitfalls which inevitably lead to unhappiness. A successful marriage must be based on more than physical attraction, for, though essential, this quality is the earliest to wane, and if there exist no strong bonds of similar taste and interests, education and social tradition, then failure is bound to loom ahead. Therefore, unless other factors are so strong as to counterbalance divergences of thought and mind, it is generally well to avoid mating with one of a different race, social class, or religious tastes, otherwise, when the first ardour has subsided, those very differences which at-

tracted at first by their novelty will be apt to jar and lead to quarrels and estrangement.

Even more important than all this is the question of health. Some have advocated compulsory medical examination with the granting of a certificate of sound health, before a marriage can be legally contracted. This is not absolutely necessary if even a minimum of foresight and commonsense is exercised, for there are very few diseases or defects which need forbid marriage, but there are very many indeed which should prohibit parenthood. It should be clearly realised that marriage need not involve parenthood if it is not desired or desirable. There are many cases where marriage may be right but parenthood wrong. Parenthood should be the blossoming of health

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'and love, and where, for any reason, circumstances are adverse to the chances for the unborn child, this great task and responsibility should either be postponed until health has improved and circumstances altered or given up altogether if disabilities of a serious nature exist.

Among the few conditions which should absolutely forbid marriage are infectious diseases, venereal diseases of any kind until complete cure is certain, and insanity in certain of its forms. To marry while suffering from such illnesses as these is to commit an unpardonable outrage upon the marriage partner, and also, if conception takes place, upon the unborn child.

'There are many conditions which may make a marriage incomplete, or which may detract from its perfection, but which need not prohibit it if the other partner, with full knowledge beforehand, consents and is willing to go on with the contract. Among these, for example, are various defects of the genital organs in either sex. • If either partner to the proposed union has any reason to fear he or she is not sexually healthy or is abnormal in any way, a full medical examination should be arranged beforehand, and the doubt either dispelled or the facts faced bravely, as the case may be, and the betrothed taken into full confidence about the matter. Any such defect should, of course, forbid parenthood, for such defects may be transmitted to the offspring, and they do not all ensure sterility. No one wishes to bring into the world a child who will be handicapped by defect or deformity, and it is the plain duty of anyone so burdened himself not to pass on the taint.

• The power of heredity is only now beginning to be understood, but we know that certain conditions are passed

Heredity and Marriage. on from one generation to another, and that those afflicted with them should never have children if they care at all for the prospect of those children's happiness and for the soundness of the race. Among those conditions may be mentioned epilepsy, deaf-mutism, haemophilia (bleeding), mental

instability or defect, hereditary blindness, and deformities of many kinds. • Other conditions, not so grave, nevertheless are sufficiently serious to make it imperative not to marry a partner with the same weakness or of the same family stock, for then the children can hardly escape. Asthma and short-sight belong to this category.

The very best legacy one can possibly leave to one's children is sound health of mind and body, and, as well as being the best, surely this is also the least that we should give them ; and those of us who are not sound in ourselves should abstain from parenthood, making, perhaps, a noble and honourable sacrifice of our wishes for the sake of the next generation.

It should be clearly understood that deformities caused by injuries are not inherited ; for example, loss of limbs, or of sight, and disfigurements caused by accidents or war wounds are not passed on from parent to child, and so do not in themselves forbid fertile marriage. This should be widely known, for the fear of this has caused dread and unhappiness in some cases, and there is no need for it to do so. Such fears are quite groundless—injuries are not inherited.

What is the best age for marriage? The best age for love and marriage is youth ; youth with its ardour and adaptability, and with all the future before it ; but it must be strong and well developed in body and mind, its own growth and training completed, not immature and still dependent on others for its own protection and support. So serious a step must not be rashly taken, however, and time must be given to prove that the passionate romantic love of youth has the foundation of deep affection, which is the basis of happiness in later married life.

From the early twenties onwards, marriage may be undertaken with success, and the help and happiness derived from loving companionship and mating will aid the early steps towards establishing a position and making a career, provided that the responsibilities of parenthood are not under-

SEX AND HEALTH

taken until sufficient success has been attained to justify it. If these responsibilities are deferred, a young couple could marry and both continue their employment until a home could be established suitable to receive their first child. Such a marriage would not be improvident, but wise, and founded on foresight and responsibility.

To defer marriage too long is a mistake, for after the age of thirty-five it is much harder for both man and woman to adapt themselves to their partner in the mutual give-and-take involved in living together. Habits have become set, and there is less chance of growing together than with more youthful partners. But, in spite of this, many late marriages are very happy, and age is no bar to happy partnership, provided both are middle-aged or elderly. Mating between very different ages almost always involves the sacrifice and unhappiness of one or



"WEDDED"

Lord Leighton's famous painting in the Melbourne Gallery.

other of those who contract such an unequal bargain.

As regards the physical act of intercourse,

men-
Sex Life. tion may

be made of one or two points which may puzzle the newly married. Individuals vary greatly as regards the strength and urgency of their sex desires. To some, sexual intercourse is a most pressing need, and deprivation causes them much suffering. Others can live happily for long periods without any urgent wish of this sort, and when the desire does obtrude itself it is much more easily sublimated or put on one side. But all healthy, normal persons experience sexual desire, and

in marriage it should be a source of mutual joy and happiness.

One common fault with married men is that not enough time is given to the act, and a craving only partially satisfied is left, leading to undue frequency of repetition.

If a young bride is in any way forced or

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over-constrained when she cannot fully respond, a permanent distaste for physical union may be established which will impoverish both lives and may lead to failure of the marriage. Much of the so-called caprice and coldness of wives is due to this. But, on the other hand, occasionally an ardent young woman by her demands may exhaust and weaken a lover less well endowed physically. Both should be moderate, kind, and considerate, realising that individual desires, though deserving loving consideration, must at times be put on one side for the sake of mutual welfare.

No hesitation should be felt in seeking medical advice on any point of difficulty either before or after the wedding; and if more instruction is needed on birth control or any other point, an experienced and sympathetic doctor should be consulted. Skilled advice and care may prevent trouble and disappointment. A doctor should not be regarded only as one to call upon in illness, but as a counsellor and friend on all matters affecting health and welfare.

THE EUGENIC ASPECTS OF COUSIN MARRIAGES

By **W. M. FELDMAN, M.D., B.Sc., M.R.C.P., F.R.S.**, Senior Physician to St. Mary's Hospital for Women and Children.

THE question of cousin marriages is one which frequently crops up. There are no direct statistics of the frequency of such marriages in this country, but the late Sir George Darwin proved some fifty years ago, by an ingenious indirect method, that the average proportion of such unions for the English population is 3 per cent. of the total number of marriages.

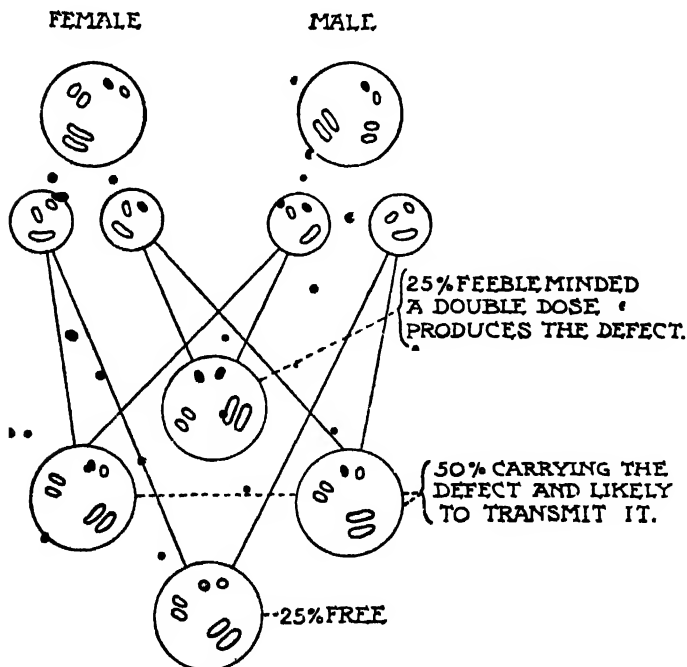
He further showed that cousin marriages are three times as common amongst the aristocracy as among the poor classes of society. This being so, it is of interest, as well as of importance, to inquire whether consanguinity has any effect—eugenic or dysgenic—upon the offspring.

There are some people who believe that cousin marriages may lead to the following deleterious results in the offspring, namely:

1. Diminished fertility.
2. Increased infantile mortality.
3. The occurrence of malformation, congenital deafness, congenital blindness, imbecility, albinism, debility, haemophilia, and many other morbid conditions.

On these alleged grounds it is urged that cousin marriage should be forbidden. The proof that those who advocate such restrictions produce in favour of their contention is that certain isolated communities, where the marriage of near kin has perforce been practised for a number of generations, contain large numbers of defectives.

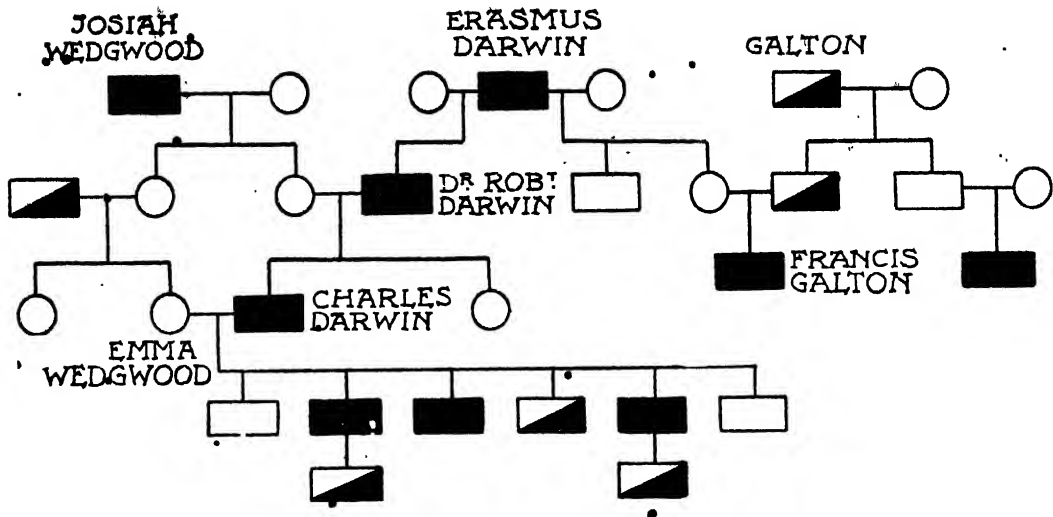
In the Bahama Islands, in the West Indies, for instance, there is a place called Hopetown, inhabited by a colony of white people, which has grown from a number of immigrants who settled there a few generations ago. Owing to their isolated position,



HOW "HIDDEN" TAINTS REAPPEAR

The black chromosomes represent a hidden taint of (say) feble-mindedness in both parents (e.g. a cousin marriage) which will cause, on the average, 25 per cent. of their children to show feble-mindedness.

SEX AND HEALTH



FELLOWS OF ROYAL SOCIETY - ■

DISTINGUISHED MEN - ▴

GOOD EFFECTS IN COUSIN MARRIAGES

The Darwin-Wedgwood-Galton family tree shows cousin marriages which brought out and emphasised the genius "carried" by its members.

and because of their anxiety to exclude black blood, frequent intermarriage has been taking place amongst them, and, according to Dr. Penrose, there is a large number of degenerates there, which he attributes to the close intermarrying of the inhabitants.

Several other examples of similar isolated communities containing considerable proportions of idiots, drunkards, deaf-mutes, etc., are frequently cited, and, indeed, when examined superficially, they seem to afford very strong evidence of the dysgenic effects of such unions.

If, however, we probe the matter a little more deeply, we find that the evidence is not so strong as it appears at first sight. Thus it is possible to cite other instances of similarly isolated communities where close in-breeding has been frequently practised for a number of generations and where the results have been remarkably good.

For instance, there is the community of Batz, on the coast of France, where amongst a population of some three thousand people,

all of whom have sprung from consanguineous unions, there is not a single case of degeneracy. The same is the case of Smith's Island, off the coast of Maryland, and also in Cape Cod.

Further, history teaches that among the ancient Egyptians, as well as among the ancient Hebrews, where marriages between the closest relatives were continually practised, the results were remarkably good. Moses, one of the greatest men that ever lived, sprang from a marriage between a nephew and his paternal aunt.

The eighteenth and nineteenth Egyptian dynasties not only practised consanguineous marriages, but continually contracted marriages between brothers and sisters, as well as other incestuous unions, and yet they contained numerous distinguished monarchs who reigned brilliantly and whose physique and features—as far as can be ascertained from the evidence available—were remarkably fine and handsome. They did not show any evidence of any pathological traits; their fertility was great, and their

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average duration of life was very considerable.

Of the greatest interest, however, is the history of the Ptolemies, because in that dynasty the first four kings were the children of non-consanguineous marriages, whilst the later kings sprang from incestuous unions, and yet comparison fails to reveal any difference between the first and second groups. Indeed, Cleopatra, of the second group, was remarkably sharp-witted.

Historical evidence, then, does not reveal any of the bad effects alleged to result from the marriage of people who are closely related.

Let us now see what biological science

teaches us with Biological Experiments.

regard to such unions.

Various biologists have studied the subject experimentally. They have effected "brother-sister" matings

in rats for more than twenty generations, and they found that the result was a superior race of animals. In fact, they have found that close "in-breeding" is very useful in perpetuating and developing any particularly valuable character.

On the other hand, if there is any morbid character in the parents similar "in-breeding" tends to perpetuate it. The same, no doubt, holds good in the case of man. The Bachs freely intermarried consanguine-

ously, and were very prolific in musical talent. Similarly with the Darwin family. At the same time, certain pathological characters like epilepsy and insanity will, when present in the families of both parents, show themselves in a greater degree in the offspring of consanguineous unions.

To summarise: it is justifiable to say that the study

of the Summary. histo-

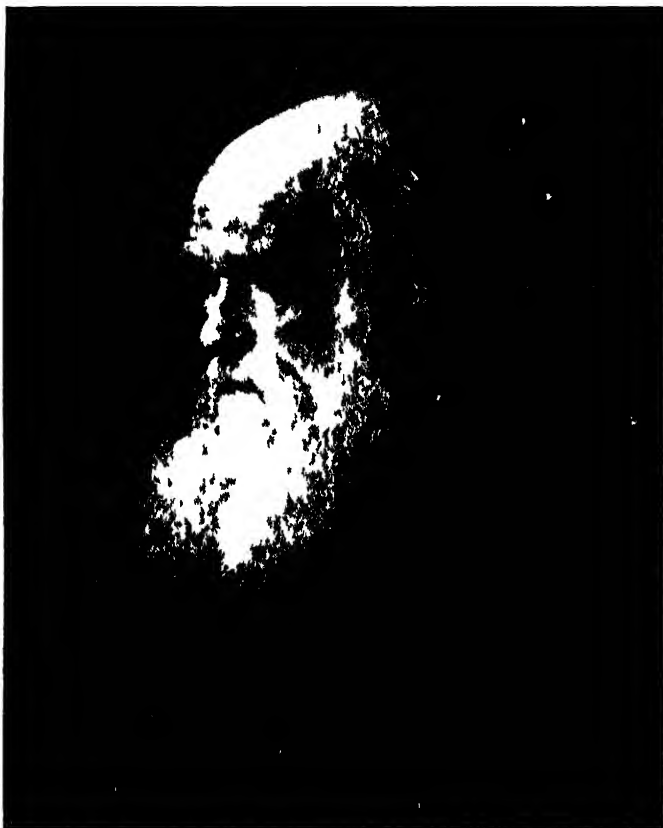
rical, statistical, and biological evidence at present available, permits the following conclusions to be drawn:

1. There is no evidence that a consanguineous marriage is followed by reduced fertility or increased mortality in the offspring.

2. There is nothing connected with consanguinity, *per se*, which makes a union between relatives prejudicial to the offspring.

In other words, no morbid conditions will be created in the offspring of a cousin marriage if the parents are themselves of good stock.

3. If, however, there be any tendency to certain diseases, which are known to be hereditary, in the family, then the risk of the disease appearing in the offspring is greatly accentuated by a consanguineous marriage, even if neither of the partners manifests the disease.



CHARLES DARWIN (1809-1882)

The famous exponent of the doctrine of Evolution, and member of a brilliant family interrelated by cousin marriages.

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4. On the other hand, if there is any particularly desirable character in the family, such as great musical or mathematical ability, or other mental or physical talent, then a cousin marriage, in virtue of its tendency to perpetuate and fix that character in the offspring, is much more desirable than a non-consanguineous union with a stranger, whose antecedents may be less well known.

THE PROBLEM OF THE UNFIT

By THE LADY ASKWITH

A PASSIONATE interest has of late been manifested in the preventative and curative modes of feeding and treatment which must result in untold benefit to the rising generation. Yet I must honestly add that some aspects of the future fill me with dismay, and unless prompt action is taken, we are heading straight for disaster. It is becoming impossible for the children of a large section of the population to have any chance in life, either because their parents are too poor to give it to them, and the State cannot cope with the increasing numbers of that portion of its citizens; or because the fathers and mothers are unfit, either mentally or bodily, to have any children at all.

Take the case of the woman who told a magistrate recently that she had had twenty-four children, that they had

Family Restriction. brought her happiness, and she recommended other women to do

likewise, but that her husband, during that period, or at all events a great portion of it, had only had thirty-three weeks' work! What State could possibly keep pace with that sort of thing, if it became general? It hardly seems fair on the middle classes, who supply the bulk of the taxes, and are

obliged, as they nearly all do, to restrict their own families in order to bring them up decently.

The upper and middle classes practise birth control, and rightly so, this country being very much overpopulated already. The poorest class of all has, as

a rule, neither the means nor the knowledge to enable it to do likewise. Why should it be thus set apart and condemned to ignorance? I am very strongly of opinion that the public health authorities should, on application, be authorised to impart such knowledge to men and women asking for it. One has but to read the report of the Walworth Birth Control Clinic in the South-east of London to see how badly it is needed.

But there is an even stronger and more terrible case against the procreation of children by those who are bodily diseased, or who are mentally deficient; the latter being notoriously more fertile than any other class of the community. Mr. Harold Cox says, in his *Problem of Population*, that 13 parents will produce 13 children, and while money is lavished on the cure—or rather treatment—of these unhappy little mortals, few people seem ever to have considered how wrong it is that any one should have brought them into the world at all. To take one disease alone, Sir William Osler told us that a very large proportion of the blindness, deafness, and insanity in the world falls to the lot of, and is propagated by, the children of parents afflicted with venereal disease. That disease would be stamped out if it was made a legal crime, as it is a moral one, to propagate it.

The mentally deficient are increasing so rapidly that they will become a tragedy to the nation unless something is done



[Signed.]

DR. W. M. FELDMAN



THE LADY ASKWITH

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soon. The Ministry of Health is endeavouring to cope with these, but the expense of

State
Burden.

its demands on local authorities will probably prevent much being done. In one case I know of, it demands that premises for *five hundred* people should be secured, and that building such premises should be at the rate of £300 per bed, and £50 extra per bed for furniture. These demands seem to me preposterous, when in the same place houses are built for sane working men at about the rate of £100 per bed. The mentally deficient are not worth so much to the community. To keep them happy, and to prevent them from breeding, is all that can reasonably be aimed at—except, occasionally, in the case of children.

If left to themselves the mentally deficient increase very rapidly, and their offspring fill the workhouses, hospitals, and prisons. In one county alone there were, last autumn, fourteen mentally deficient women, who had between them *one hundred children*—all in the different workhouses. They have probably increased since then. How can any county bear such a load as that?

In the State of Indiana, U.S.A., a statute was passed in 1907 providing that the inmates of all State Institutions deemed by a committee of three surgeons to be unimprovable physically and mentally, and unfit for procreation, should be sterilised. The operation is now a light one for both sexes, and soon over. It is said not to injure the health at all, and even sometimes to improve it. The superintendent of the California State Hospital reported in 1912 "that, as a general rule, all are benefited to some extent by the operation."

It seems to me a hard thing that mentally deficient people should be kept under perpetual restraint, unless they are a danger to themselves, or to their neighbours. Could it not be ordered that they should not be allowed out of sanatoriums unless they consent to be sterilised and are otherwise non-infectious? In California they report

little difficulty in getting the consent either of the people themselves, or their relations, and many can afterwards be discharged.

Something *must* be done unless the country is to be overrun by the diseased and the mentally unsound. I believe that the vast majority of women who have worked as guardians, county councillors, nurses, or in such other public capacity, would recommend the teaching of birth control, when desired, to all classes, and some measure of the kind indicated above, for the diseased and mentally deficient, as necessary to the community, and the truest mercy to the people concerned.

BIRTH CONTROL

By MARGARET SANGER, *President of the American Birth Control League Inc.*

ALTHOUGH the term "Birth Control" is of recent origin, having been first used by Margaret Sanger in 1914, the doctrine of conscious control of the birth-rate dates from 1803. In the second edition of his celebrated *Essay on Population*, Robert Malthus, an English clergyman, emphasised the imperative necessity of such "prudential checks" as abstinence and late marriage to control excessive increase in population.

The crux of his theory was that everywhere population tends to increase beyond the means of subsistence. A History. detached thinker in economic theory like Malthus offered no practical solution to the problem he had raised. But others lost little time in pursuing the implications of the Malthusian theory to their logical conclusion. Between the years 1818 and 1821, James Mill advocated the limitation of births, declaring that "a solution would not be very difficult to be found . . . nor difficult to be applied."

In 1823, a small leaflet, addressed to the married of both sexes, setting forth the economic burdens of excessively large families, and describing with frank simplicity various

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methods of preventing undesired pregnancy, was circulated in Manchester, England. Known as *The Diabolical Handbill*, this leaflet was generally attributed to Francis Place. In 1826, Richard Carlile published in London his *Every Woman's Book*, also giving practical advice. In 1833, Dr. Knowlton, of Boston, Mass., published his *Fruits of Philosophy*, a booklet which described contraceptive methods. This book became internationally important in popularising family limitation. *The Elements of Social Science*, by Dr. George Drysdale, was published anonymously in London in 1854. This was the first presentation of birth control from the economic, philosophical, and medical standpoint. This book did more than any other to awaken public interest in birth control in all countries, for it was widely translated. Charles

Bradlaugh's interest in contraception was first aroused by this book.

A fresh impetus was given to the movement in 1877, when Charles Bradlaugh, an influential politician and publicist, and Mrs. Annie Besant, distributed 185,000 copies of the *Fruits of Philosophy*, written by the Boston physician, Dr. Charles Knowlton, and were arrested and brought to trial on a charge of circulating indecent literature. Widespread publicity was given to their

trial, and they were finally exonerated. This effort at suppression was not successful. Whether the distinct drop in the birth-rate in England from that year was the result of the propaganda, it is impossible to determine. One immediate result was the foundation of the Malthusian League by Drs. George and Charles R. Drysdale, and the latter's wife, Dr. Alice Vickery (Drysdale).



THOMAS ROBERT MALTHUS (1766-1834)

The English clergyman and political economist who was one of the first to advocate the limitation of population.

The first meeting of the Malthusian League took place on

26th July 1877, almost immediately after the Bradlaugh - Besant trial. Its organ, *The Malthusian*, was first issued in February 1879, to appear monthly without a break until the present time, although its title was changed in 1922 to *The New Generation*. The fundamental principles of negative eugenics, which now form the practical basis of the British eugenics

movement, were laid down in that paper in its first year. The movement soon began to spread into other countries. In 1881, Dr. C. R. Drysdale was invited to lecture in Amsterdam. His visit resulted in the formation of a Dutch Neo-Malthusian League and of the first birth control clinic of Dr. Aletta Jacobs. Germany followed in 1895 with the Sozial Harmonisches Verein, founded by Herr Max Hausmeister. In France, the movement was started in

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1900 by M. Paul Robin, who immediately took steps to form an International Federation de la Regeneration Humaine, which held its first meeting in Paris in that year. The federation began to grow, and at its second congress in Liege, in 1905, Great Britain, France, Holland, Belgium, Germany, and Spain were represented. At the third congress at the Hague, in 1910, and at the fourth, which was organised by the league at the official invitation of the authorities of the great Hygienic Exhibition at Dresden, the attendance and number of countries represented had greatly increased.

During the first half of the nineteenth century, family limitation had been widely advocated in America. It is not generally recognised that the United States have played an important rôle in the development and growth of the idea. Two presidents, Thomas Jefferson and James Madison, were ardent champions of Malthus. Robert Dale Owen, United States senator and ambassador to France, promulgated the idea. His book, *Moral Physiology*, played an international rôle in the battle against prejudice and tradition. Ralph Waldo Emerson and Robert Ingersoll expressed sympathy and understanding of the idea. The practical treatise which precipitated the great fight in England in 1877 was written by an American physician.

But the champions of contraceptive education were more rigorously suppressed in the United States than were their American colleagues in Europe. Through the efforts of Anthony Comstock of the Society for the Suppression of Vice, contraception was included in an obscenity law passed in 1869 by the legislature of New York. Many other states subsequently enacted laws of this type, and, in 1873, through Comstock's efforts, Congress enacted a statute excluding information concerning contraception from the United States mails, declaring such information illegal and obscene.

This was the statute invoked against Margaret Sanger, when, in 1914, she inaugurated her campaign for education of

American women of the working classes in hygienic and scientific methods of contraception, which she named "birth control." She was arrested and indicted under the Federal law just mentioned. A number of prominent British writers and publicists addressed an open letter to President Wilson on Mrs. Sanger's behalf, which aroused American interest in her case, and the prosecution against her was dropped. But, in 1916, when she challenged the constitutionality of the state law by opening the first American Birth Control clinic in New York, she and her assistants were again arrested and imprisoned. Her conviction resulted in a decision by the Court of Appeals, permitting physicians to give contraceptive advice and prescriptions to married people "for the cure or prevention of disease."

Since the close of the Great War, there has been renewed and more widespread interest in the practical aspects of birth control, and a general acceptance in the Anglo-Saxon countries of the programme of education through the agency of welfare clinics, where instruction is given under the direction of physicians and duly registered assistants. In 1921, Marie Stopes, a doctor of philosophy, inaugurated in London a "Mothers' Clinic for Constructive Birth Control"; and during 1922 the Malthusian League opened the Walworth Birth Control Centre, following a six months' leaflet campaign amongst the working classes of South London. The success of the Walworth Centre was instrumental in giving rise to the Society for the Promotion of Birth Control Clinics, with its numerous centres. The success of the experimental clinics has led to a movement to obtain the sanction of the Ministry of Health for similar instruction to be given at public health centres. In 1924, a deputation, headed by H. G. Wells, and made up of women of the Labour party, appeared before the Minister of Health, demanding that birth control be made part of the ante-natal work at all welfare and maternity centres.

On 9th February 1926, for the first time in history, the problem of birth control was

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discussed in the House of Commons, when the bill to authorise contraceptive instruction at all maternity and child welfare centres was voted down. House of Commons. —87 members being in favour of the project, and 167 against it.

A similar bill was introduced into the House of Lords by Lord Buckmaster, where it was passed by 57 to 44. This was one of the greatest victories in the history of the doctrine. It was the first time in the entire world that a legislative body had placed the stamp of its approval on the idea or authorised the practice of birth control. The discourse of Lord Balfour in the House of Lords in favour of birth control, during this historical session, created a profound impression in England, and has been influential in the popularisation of the idea.

Since the war, the programme for birth control has been taken on the proportions of a world movement; though France, which in the eighteenth and nineteenth centuries

had been foremost in the practice of contraception, in 1920 passed a law forbidding the exchange of any information concerning contraception, and has inaugurated national propaganda for "repopulation." Likewise Italy, under the régime of the Fascisti, has enacted laws against the advocacy and the practice of birth control. On the other hand, there is evidence of awakening interest in Japan, China, and India. Subsequent to a visit of Margaret Sanger to Japan and the oriental countries, clinics were estab-

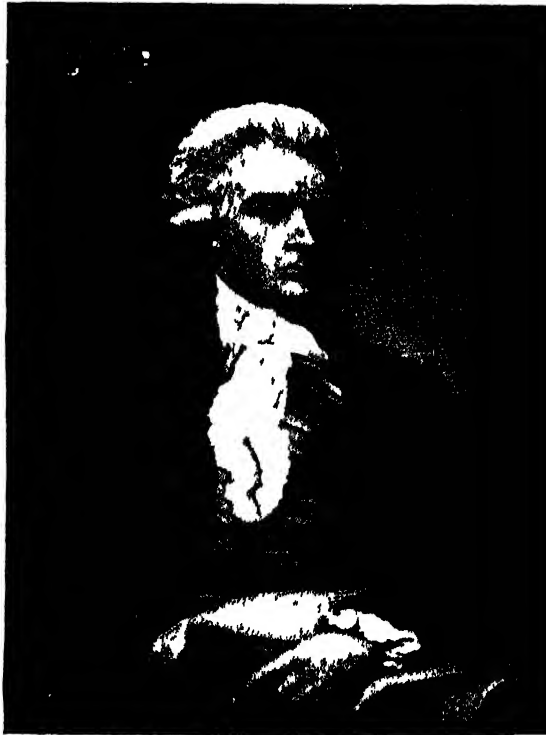
lished in Tokio, Osaka, Bombay, and Calcutta. The Labour Government of Mexico, under President Calles, in 1925, inaugurated birth control clinics, and officially distributed in one year no less than 200,000 copies of a practical pamphlet. In 1925, at the sixth International Neo-Malthusian and Birth Control Conference, held in New York, delegates from no less than twenty-nine countries attended. An international federation of birth control

leagues was formed. Out of this organisation has grown the "World Population Union," organised for the purpose of research into the world population problems. In 1927, the first World Population Conference, organised by Margaret Sanger, was held in Geneva, Switzerland, and its deliberations were conducted under the chairmanship of Sir Bernard Mallet.

The menace of overpopulation as a potential cause of war was emphasised by the international league of Neo-Malthusians,

and its importance insisted upon in a manifesto issued in 1927:

"We submit that the League of Nations has not yet paid sufficient attention to the problem of over-population as a cause of war. In our judgment it is the most serious of all the causes of war, because when it has been allowed to develop, no appeal to reason will be able to remove it. In the case of other differences between nations, compromise is often possible, and often the mere postponement of a crisis will suffice to



THOMAS JEFFERSON (1743-1826)
A President of the United States who did much to further the cause of birth control.

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prevent a conflict. But where a nation has not room in its own territory for its own people it must seek an outlet in other countries. On this broad issue no compromise is possible, and postponement only makes the appeal to force the more imperative. To-day the population of many countries is growing so rapidly that unless the growth is checked a far-reaching struggle for the possession of the portions of the earth still partially vacant cannot long be postponed. Already the government of the United States has taken steps to close its territories to unrestricted immigration. Asiatics are excluded entirely; the number of European immigrants is strictly limited. This action, which the American people have taken to defend their own interests, conflicts with the obvious interests of at least two other important nations—Italy and Japan. Unable to settle in the United States, the constantly overflowing populations of Italy and Japan are forced to seek new outlets.

“The only way to prevent future wars for the acquisition of territory is to persuade the nations of the world to control the growth of their respective populations.”

In answer to a charge that the knowledge of contraception leads to promiscuity and sexual immorality, the advocates

Moral Aspects. of birth control state that on the contrary it develops a sense of responsibility, foresight, and autonomous self-mastery. Furthermore, it is claimed that the good of society at large should not be hindered by undue consideration of the behaviour of a small and exceptional minority.

• All privileges and human benefits may be abused, and birth control is no exception. Advantages derived from the great institutions of civilisation, such as education, citizenship, and the home, far outweigh their abuses. To claim that if birth control methods were available, single people would rush in great numbers into promiscuous sex conduct is to say that virtue is only a sham, and that men are virtuous only because of fear of the consequences of their acts, not because of native moral integrity. Most

people are moral in spite of temptation. It is true that there is a minority lacking in strength of character. These usually do wrong in spite of every precaution, but they are in the minority, and that this class cannot be regulated by legislation is already abundantly demonstrated. Evil resulting from knowledge cannot be greater than evils resulting from ignorance.

Economists and sociologists have demonstrated that a declining birth-rate does not

Economic and Political Aspects. necessarily imply a decline in population, but that on the contrary the survival rate may indeed increase. Increase in population

is dependent upon the ratio between the birth-rate and the death-rate. Research has shewn that a declining birth-rate is almost invariably accompanied by a decline in the death-rate. Thus, although the birth-rate in England has fallen from 36 per 1000 in 1877 to 18 per 1000 or less to-day, this decline has not meant a decrease in population. The death-rate has correspondingly fallen. Reasons for the increased rate of survival are attributed by experts to the remarkable advance achieved during the last half-century in sanitation and medical science, to the increase in humanitarianism, and the remarkable reduction in infant mortality. A high birth-rate, a high death-rate, and a correspondingly briefer duration of the average life are characteristic of the so-called backward or uncivilised countries.

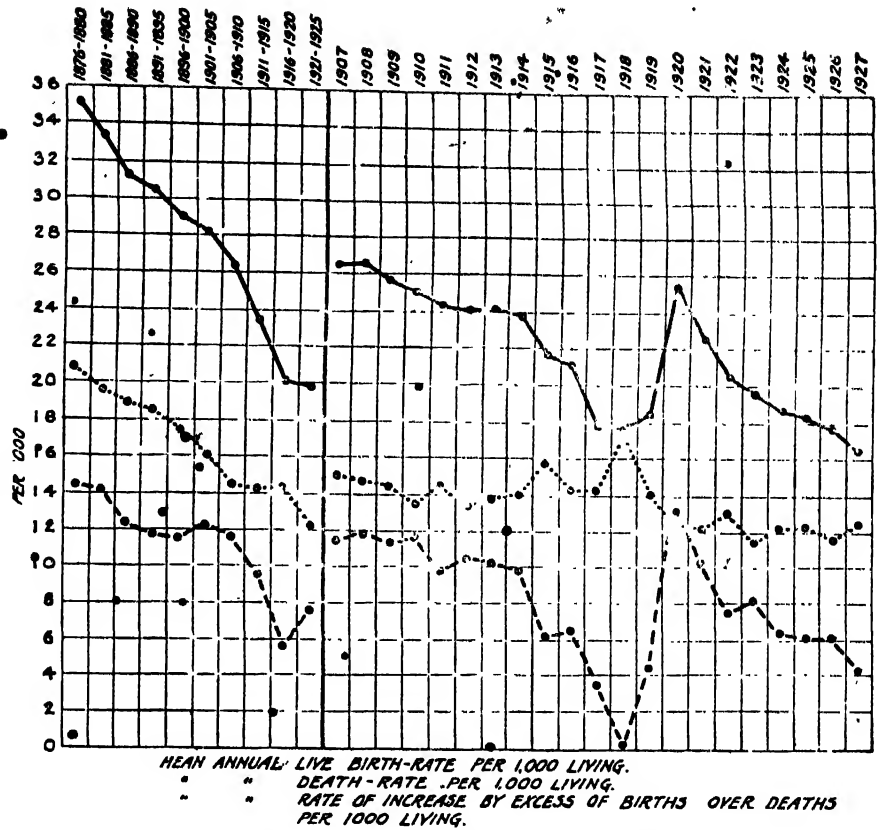
This truth has likewise been found applicable to the various classes. Statisticians have discovered that the highest birth-rate is to be found among the poorest and least responsible classes. The defective and delinquent and the least responsible elements in any community are the most prolific. Defective stocks are most active in propagating and perpetuating their deficiencies. Problems of crime, of feeble-mindedness, of delinquency, and dependency have been shown to be intimately correlated with excessive fertility. Economic and industrial incompetence and large families are invariably correlated. Those biologically

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least fit to carry on the race increase most rapidly. People who cannot support numerous offspring are even aided by charities to produce excessively large families. Many of the children thus begotten are subnormal, or feeble-minded; many become criminals. The burden of supporting these undesirable has to be borne by the healthy elements of the nation. Funds that should be used to raise the standard of our civilisation are thus diverted to the maintenance of those who lower it. In this indictment, birth control unites with eugenics.

In addition to this great evil, we witness an appalling waste of women's health and women's lives by too frequent pregnancies. These unwanted pregnancies often provoke the crime of abortion, or alternatively multiply the number of child workers, and lower the standard of living.

The economic and industrial cost of these dysgenic factors of modern civilisation is stressed by the champions of birth control. While the population has continued steadily to increase, nothing has been done to improve its quality. Eugenists and biometricians have investigated the problem, and pointed out the necessity not so much of the control of the quantity of population as the improvement of its quality. They emphasise the



NATURAL INCREASE OF POPULATION

The birth-rate in England and Wales is falling, but, since the death-rate is also falling, the population continues to increase. For the war years (1915-1920), civilians only are included.

need of an optimum population. In Great Britain, according to authorities, the population has steadily increased without adapting itself to a diminished national power for the employment of labour. By slow degrees the unemployment problem arose to larger and larger proportions. "The present formidable figure of nearly a million and a quarter of unemployed, together with a large number of workers on short hours, testifies to the fact that at the present time, in relation to existing economic conditions, this country seems to be overpopulated."

Conditions in the so-called high birth-rate countries are more deplorable. Actual, as opposed to potential overpopulation, may result in two phenomena: (1) a tendency toward expansion and emigration—aggressive seeking for new territories which may possibly eventuate in war; or (2)

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famine and retrogression. Italy, Japan, and pre-war Germany are examples of the first phenomenon, while India and China, inert and subject to periodic famine, typify the second tendency. The increase in the population of Germany, prior to August 1914, was warmly advocated by her militaristic leaders, without regard for the country's capacity to support her constantly expanding population. Total exclusion imposed by the United States upon immigration from Japan has accentuated the problem in the Far East. Now that still further restrictions have been imposed upon the entry of Europeans, and particularly Italian immigrants to the United States, the overpopulated and expanding peoples of Southern and Eastern Europe may seek new territories or try to find new solutions to

the economic problems confronting them

From the medical point of view, the use of contraceptives is indicated when husband and wife are victims of diseases of Medical. a hereditary character, such as certain forms of insanity; of syphilis or gonorrhea, etc. Also when there are physiological conditions that make possible child-bearing dangerous, such as pelvic de-

formity, severe debility, and varicose veins, caused by frequent child-bearing. . .

In addition to these medical indications, social, economic, and individual reasons may determine the advisability of avoidance of pregnancy. Some of these advocated by exponents are: (1) Child-bearing should

be avoided within two or three years after the birth of the last child. Commonsense and science unite in pointing out that the mother requires at least this length of time to regain her normal strength in order to give a new baby proper nourishment both before and after its birth. For the mother's sake it is sufficient to point out, as does Findley, in *Diseases of Women*, that "frequent child-bearing . . . almost certainly results in some sort of pelvic ailment." (2)

No more child-

ren should be conceived when the parents, though healthy themselves, find that their children are physically or mentally defective. (3) There should be no more children whenever the conditions of life and the uncertainty of livelihood make it improbable that the children can be given proper care, both as to their physical and mental needs.



IN THE HEAVILY POPULATED EAST

An example at Jaipur (Rajputana, India) of the seething populations which are showing an awakening interest in birth control

SEX AND HEALTH

PRACTICAL METHODS OF • • BIRTH CONTROL

By Mrs. ETTIE A. HORNIBROOK, Author of
"Practical Birth Control," * etc.

To understand the practical methods of birth control, or the control of conception, we must first have a clear view of the processes involved when the reproductive organs are in activity, and of the nature and situation of the sexual organs themselves.

Now fertilisation does not necessarily occur whenever the male organ comes in contact with the female organ. Fertilisation occurs only when a male cell (spermatozoon) unites with a female cell (ovum); in other words, when the spermatozoa in the seminal fluid of a man meet and unite with the germ or ovum in the body of a woman. That is the beginning of the child. This union of the two cells need not take place during or immediately after sexual intercourse. It may occur many hours, or even two or three weeks, after connection, because the spermatozoa have motion of their own. They are tiny thread-like bodies, which may work their way towards the ovum long after they have left the body of the man and been placed in the body of the woman, and the uterus has a searching movement, and may by its pulsations draw the spermatozoa upwards. For these reasons, a woman cannot be quite sure of the exact time of fertilisation, and hence cannot predict exactly the date of the child-birth. Generally the pregnancy lasts nine months, but it may last longer—say ten months on rare occasions; and it may be extended apparently by a delay in fertilisation; that is to say, spermatozoa deposited near the orifice of the vagina may live and move for days or weeks, finally meeting and fertilising the ovum.

For many reasons, which I need not enumerate here, the precautions against impregnation can most easily and effectively be taken by the woman, rather than by the

man. She is the one fertilised, and therefore she is the one to guard herself against fertilisation.

There are two methods of preventing fertilisation:—

1. The chemical method: that is, the destruction of the male cells (spermatozoa) by means of a suitable germicidal substance, such as many of the disinfectants; and

2. The mechanical method: that is, the adoption of measures which keep the male and the female cells apart from one another.

Neither of these two methods in practical application by ordinary women can be said to be completely certain. Both are apt to fail at times. The chemical method, that is, the application by the woman of a suitable soluble contraceptive suppository before connection, or of a germicidal douche (such as a dilute solution of monsol) after connection, or both these measures taken consecutively, may fail because of some fault in application, or because the seminal fluid actually enters the womb during intercourse; that is to say, when emission takes place, the end of the male organ may be exactly opposite and close to the mouth of the womb, and the spermatozoa in the seminal fluid enter directly into the womb, and cannot then be removed or destroyed by douching or contraceptives of any kind. Now if the physical conformation of the reproductive organs of the husband and the wife render this event possible or probable, then soluble suppositories and contraceptive douching are alike unreliable by themselves or in combination. On the other hand, the mechanical method, that is, the use of a rubber protector, preferably the watch-spring occlusive "Dutch" pessary, by the woman, may also fail, if the protector is porous or ill-fitting. But, if the two methods are combined, the chemical method and the mechanical method, then the protection against fertilisation may be regarded as almost absolute. The completeness of the protection depends, of course, upon the proper application and combination of the measures advised. If complete safety is to be ensured, the rubber pessary must, in the

* This explanation is, by kind permission of the publishers, quoted from *Practical Birth Control*, by Ettie A. Hornibrook (Ettie A. Rout), with Preface by Sir Wm. Arbuthnot Lane, Bart., C.B., M.S. (Heinemann, 3s. 6d. net.)

first instance be fitted by a doctor qualified in this branch of preventive medicine. If the pessary does not fit properly, it may be ineffective. The seminal fluid may pass by its loose rim and impregnation may result. If the rubber pessary has been properly fitted, and it is not porous, the protection should be complete; but if, by any accident, spermatozoa should get beyond the rubber pessary, they will be destroyed and entangled in the melted suppository—provided, of course, that a suitable suppository has been used. It is all a question of getting the right articles to begin with and using them with knowledge and intelligence. But there is this chance—a bare chance—of accidental impregnation, and we want to eliminate all chances, if possible. Assuming the rubber pessary fits properly, as it will if skilfully selected and applied in the first instance by a competent medical practitioner, then the seminal fluid must remain in the lower part of the vaginal passage. An hour or two after intercourse, or next morning, this seminal fluid can all be washed away by the use of syringe and bidet. It is far better to sit over the bidet and syringe in that position than to squat down over a basin—an uncomfortable and unsuitable position for douching, because the walls of the vagina in that position may be pressed hard together. The douche should be retained in the vagina for a minute or two by pressing the flange of syringe closely against the orifice of the vagina. After syringing, but not before, the rubber pessary should be removed (to be washed with soap and water, dried, powdered, and put away till required again), and immediately after removing the rubber pessary it is a good plan to facilitate the ejection of the surplus fat of the suppository by urinating and re-syringing.

The following briefly summarises these recommendations:—

1. *Before Intercourse.* Wash, and be clean. Insert soluble suppository, and then place rubber pessary in position, hollow side downwards. This will slip up more easily if slightly soaped, or anointed with Proseldis

Birth Control Jelly. No harm can possibly come either to husband or wife from these appliances, and neither party will be conscious of the presence of the occlusive rubber pessary (some other kinds of rubber pessary have not these advantages). The pessary can be inserted some hours before intercourse, and need not be removed till some hours afterwards. The rubber pessary should not be worn continuously. If you have mislaid the pessary, a small rubber sponge, a piece of clean cotton-wool, or even a piece of soft tissue paper can be used. Native women in different countries use seaweed, moss, sponge, etc., and Japanese women use crumpled rice-paper to plug upper end of vaginal passage. But these articles are not so clean or reliable as the occlusive rubber pessary. If sponge or cotton-wool is used, it should be saturated in contraceptive lotion or smeared with contraceptive ointment or made soapy before insertion. But always remember—the rubber pessary is cleanest and safest.

2. *After Intercourse.* Douche next morning (or earlier), remove rubber pessary, wash and dry it, and put it away slightly powdered.

3. *Daily.* Cultivate in yourself and in the members of your household habits of sexual cleanliness. Wash, and be clean. Apply this to all the openings of the body, but in particular to the vagina, urethra, and anus, which should all be cleansed night and morning. This practice is not simply cleansing and refreshing, but it helps to prevent many forms of disease, such as piles, etc., and

4. Always remember that the spread of this kind of knowledge has been made possible by the long and patient efforts of hundreds of doctors, many of them unknown and forgotten, and that women will best be able to apply this knowledge efficiently by working in loyal co-operation with free and enlightened medical practitioners.

Fuller details are given in "*Practical Birth Control*," the various other methods of contraception are discussed, and lists of medical supplies are published with addresses of the depots from which they can be obtained.

SEX AND HEALTH

SEX EDUCATION OF THE YOUNG

By **MEREDITH ATKINSON, M.A. (Oxon.)**,
*Literary Secretary of the New Health Society;
 Lecturer in Economics and Political Science to
 Cambridge University Board for Extra-Mural
 Studies; formerly Professor in the University of
 Melbourne.*

It is not many years since this subject was almost taboo, so far as the possibility of its treatment in books of general circulation was concerned. Fortunately, the atmosphere in which it is discussed to-day is becoming ever more free from the prudery and prejudice which has obscured it for generations.

Perhaps the very first principle to grasp is the fundamental danger implied in the term, "sex education." Sex should not be regarded as a compartment of life, but an indissoluble element of it, not a separate subject of the school curriculum or a cross-section of the child's development, but as forming part of the very warp and woof of his education and growth.

The vast majority of children still, doubtless, reach adolescence either in ignorance of true sex knowledge, or having learned what they know from tainted and otherwise undesirable sources. For a long time to come, therefore, parents and teachers will be faced with the problem of how to lead such children, in the light of understanding wisdom and love, to a right orientation of

mind towards this vital subject. Nevertheless, even in these cases the teaching should be carefully related to the general education and stage of development, psychological and physical, of the individual child. Otherwise more harm than good may easily be done. Mass teaching on sex is full of dangers.

We may now outline, perhaps, the general principles and considerations which should

be borne in mind by all those responsible for the cultivation in the young of true knowledge and right ideas in all those ramifications of life and conduct vaguely grouped under "sex."

1. *Curiosity about sex, as about most other aspects of developing life, is perfectly natural to the child.*

The "conspiracy of silence," on the part of parents and educators, leads, not to protective innocence, but to ignorance charged with disaster, to furtiveness and dangerous suppressions, fraught with crippling com-

plexes that may render later life intolerably unhappy, or inhibit the development of a full personality; or such silence is defeated by the acquisition of poisoned knowledge from the numerous sources supplied by modern life.

2. *The natural curiosity of a freely developing child is the invaluable guide.*

The parent and teacher must be ready at any moment to supply the information



MEREDITH ATKINSON, M.A.

(Lafayette)

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which the child's innocent questions demand. Watchful observation will suggest the proper grading and application of the knowledge required at each particular stage. Evasions, falsifications, and foolish 'fairy stories' must be strictly avoided. Children are intensely alive to such deceptions.

3. *Sex instruction should proceed pari passu with the child's physical and mental development.*

As the child and youth grow and exhibit their own individual characters, needs, and problems, so should the wise educator watch for his or her opportunity to convey the fundamental truths of sex development and conduct. It is dangerous to wait until the age of thirteen or fourteen and then administer sex knowledge in the mass, and thus risk causing not only mental and moral indigestion, but also the possibility of an injurious and lasting shock to the personality.

4. *Sex instruction should anticipate the stage at which the child is likely to need it.*

This does not contradict the principle that natural curiosity should be our guide. It merely indicates that we should watch the child's mental growth and his questions, so as to enable us to anticipate his naturally developing needs. Further, it is obviously good that boys and girls should be gradually prepared for the serious bodily and mental changes that occur at the age of puberty.

5. *Full advantage should be taken of the individual and social virtues.*

As the child's character develops, the educator can make powerful appeals to his affections, his natural emotions, his love of the heroic, his ambition to shine before his fellows, and can take advantage of innumerable situations to arouse in the child the highest aspirations towards the noble life.

6. *Sex instruction should be an indistinguishable element of general education.*

The natural environment of the child supplies endless opportunities for sex teaching without arousing morbid curiosity or overemphasising one department of knowledge at the expense of education as a complete unity. The life of the garden, the hedgerows, the farm, the home and the community furnishes all we need.

Nor should sex teaching be restricted to biology or any other purely scientific aspect.

The child's universe must be made as far as possible a complete and understandable whole at every stage. For this end the simple knowledge of religion, ethics, social science, and psychology are quite as essential as that of biology.

7. *Sex instruction of boys should be different from that of girls.*

While the physical development of both sexes exhibits many common features, it is well known that males and females differ considerably in their sex development, the nature and strength of their sex impulses, and their natural attitudes towards sex relations. Most educators are therefore agreed that boys and girls should be taught separately in the subjects bearing more directly on sex, though others advocate a large measure of co-education even in this sphere. Much depends upon the teacher and the particular circumstances involved.

8. *Finally, who shall give the instruction? Parents, schoolteachers, doctors, clergymen, social workers, physical instructors, and other experts all have their place.*

Who shall instruct? All those who are responsible, as a whole or in part, for the education and upbringing of the child may usefully play their part in sex education. The person upon whom the child's affections and reverence are centred in a particular phase must generally prove the ideal instructor, given the necessary knowledge and goodwill. For young children this obviously means the parents and, especially, the mother.

Above all, it must never be forgotten that sex education can and should be made the most instructive, uplifting, and inspiring call to social service and the good life that can be presented to the growing child.

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VII

BIOLOGY AND HEALTH

THE CONTRIBUTION OF BIOLOGY

By Professor J. ARTHUR THOMSON, M.A., LL.D., Regius Professor of Natural History, University of Aberdeen.

THERE are various ways in which biology contributes to the attainment and conservation of health. Without pressing the point that the science and art of medicine must be based on biological foundations, and must change as biology advances, as in the case of our deepened knowledge of the endocrine or ductless glands, we must emphasise the contributions that biology has made to medicine in connection with the life-history of intrusive parasites.

Beside bacteriology there has grown up what is called *protozoology*, the **Parasitic Diseases.** science of the activities of one-celled animals, with practical applications of profound importance. And it is not merely a knowledge of the intruders that biology gives, but a disclosure of their interrelations with other

organisms which act as carriers or as checks. Every one knows how the malaria organism (plasmodium) is carried from patient to patient by a mosquito, whose larvae live in water-pools where they may be drowned by a film of paraffin which prevents them from attaching their breathing-tubes to the surface film, or where they may be devoured by little fishes, profitably introduced into the drinking water tanks in many Indian towns. Man, the malarial animal, the mosquito, fishes—all bound together in the web of life.

It was during the Great War that Major Leiper applied to the conquest of the

formidable disease of *bilharziasis* the story of the liver-fluke which he had learned as a student of zoology in Glasgow University. From children or adults infected with bilharzia flukes the enshelled eggs pass, in rough-and-ready sanitary, or rather insanitary, conditions, into pools and canals where children paddle or bathe. The microscopic larvae are hatched out, and after a free-swimming stage make their way into freshwater snails. There they give rise to more larvae of another type, minute "cercariae," with a forked tail, which leave the snails, and swim freely in the water.

It is usually by minute cracks in the skin that they find their way into man, and in some places every third child, in certain sections of the community, is infected with bilharzia worms. These live in the blood-vessels of the intestinal or kidney region, according to the species, and the enshelled eggs, each with a terminal or lateral sharp spine, pass out with the faeces or the urine. As we have said, the continuance of the bilharzia race would cease if they did not contaminate water-pools. While their invasion of man is usually through the skin of the hands and feet, it may also be effected by the mouth and lips. This is interesting, since one of the ways in which the disease continues is by means of raw vegetables that have been steeped or freshened in unfiltered water, and have the living cercariae adherent to them. But this again can be baulked by washing the vegetables



PROF. J. ARTHUR THOMSON

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in water to which a tablet of sodium sulphate has been added, for this salt kills the cercariae.

Major Leiper showed, furthermore, that if drawn water containing cercariae is left perfectly still, the parasites die off in thirty-six hours, after which the water may be safely used for washing purposes. We mention these details because they show how a more intimate knowledge of the ways of a formidable parasite makes its conquest easier. Furthermore, since the water-snails browse on water-plants, such as lotuses, it is possible to diminish the incidence of the disease by keeping the bathing-pools as free as possible from vegetation. Another link in the chain comes into view when we notice that certain water-birds are particularly fond of the water-snails; the more encouragement these birds receive the less will be the bilharziasis. No detail is unimportant; thus the disease in a place like Durban, where man and water-snail are the only known hosts, will be easier to control than in Japan where, with another species of bilharzia, cattle are also hosts, thus rendering the pollution of the pools more probable.

Let us take another illustration of this kind of contribution which biological science is making to the improvement of health. Perhaps the heaviest mundane cloud that has ever rested on the human race is due to hookworm—a very troublesome round worm parasite in warm countries. There are various kinds (species of *Anchylostomum* and *Necator*) whose larvae enter man's body through the skin, e.g. through the soles of the feet or the slightly abraded hands. The adults live in the intestine, sucking blood from its walls, and causing very serious anaemia. Explorers, employers of labour, and missionaries have told us that hookworm, which often produces "tropical depression," melancholy and despair, lack of initiative and unwillingness to do anything, is one of the most terrible of human diseases. In the past it has had a portentous fatality. But now we know not only how to rid a patient of his hookworms in less

than a week by doses of carbon tetrachloride, but also how to prevent reinfection. Hookworm disease would come to an end if the natives would cease fouling the soil in a random way, and would cease walking barefoot on the larva-infested soil. No one can expect a large proportion of the natives to wear boots, but simple sanitary precautions are not beyond reach. Indeed, through the magnificent campaigns of the Rockefeller Institute, carried on in many warm parts of the world during the last few years, the percentage of hookworm has fallen in some places from 23 to 2, and in others from 25 to 3—figures indicative of a very creditable conquest. Thus we see how hookworm, bilharzia, and the malaria organism are being conquered by methods which are in part *applied zoology*; and these are but three striking instances among many.

On a different plane are ameliorative suggestions that have been dug out of the bedrock of biological fundamentals.

Applied Biology.

Thus, an understanding of Mendelian Inheritance* has cleared up such previously puzzling phenomena as "skipping a generation," and the extraordinary persistence with which a defect like night-blindness may appear for centuries in a percentage of cases in each generation, and yet may never show face when a thoroughly normal member of the lineage marries a normal outsider. We are impressed by extraordinary cases such as the reiterated occurrence of bleeding, or haemophilia, in a noble lineage, back and back to a Wilhelm Ohnehauf (without skin) in the eleventh century; but minor instances of this inexorable persistence of unit characters are very frequent.

There are many other generalisations besides Mendelian Inheritance which have a direct applicability to the problems of health. Thus the whole aspect of physiology has changed since the discovery of the rôle of hormones, the secretions of the endocrine glands, and the whole aspect of dietetics has been similarly changed by the discovery of vitamins. In association with the last,

* See "Heredity."

BIOLOGY AND HEALTH

one cannot but recall the modern work on the influence of light and other rays, and the rapidly increasing body of facts which emphasise the influence of nurture on development and on health—using the word *nurture* here in its widest sense, to include all environmental, nutritional, and habitual influences.













From the biologist's outlook, diseases are disintegrative

disturbances of the normal physiological routine (metabolism, we may say) of the body. They represent metabolisms out of place, out of time, and out of tune, for there is no hard-and-fast line between the physiological and the pathological. The glutinous secretion from the kidneys of the breeding male stickleback, forming threads by which he binds into a nest numerous pieces of freshwater plants or seaweeds, would be a pathological production in an ordinary animal. The process by which the bone at the base of the stag's antlers is eaten away, so that the extraordinary growths fall off at the end of the season, would be a morbid occurrence in another type. The radical idea in disease is some *disintegrative disturbance*, but what would be disease in one creature may be normalised or regularised in another, just as one



man's food may be another man's poison.


From the broad biological outlook there seem to be three kinds of diseases. There are

—(1) *modification*al diseases, which wild animals very rarely illustrate, disturbances due to something badly wrong with surroundings, food, or functionings; (2) *constitutional* diseases, which are extremely rare in Wild Nature, disturbances, or irregularities due to some inherent or germinal deficiency or exaggeration, as expressed, for instance, in a tendency to bleeding, or to thyroid idiocy, or to gout, or to mental instability; and (3) *microbic* or *parasitic* diseases, which are due to the intrusion of other organisms, often producing poisons, and often causing tissue destruction. It is convenient to apply to the unicellular intruders the term *microbes*, and they may be—(a) very minute animals, such as the trypanosomes that cause sleeping sickness, and the plasmodia that cause different kinds of malaria; or (b) very minute plants, such as the bacteria that cause plague, tubercle, diphtheria, and so many other diseases; or (c) organisms so minute that they cannot be directly seen under the microscope, and can pass through a porcelain filter, that

MATING	CHILDREN
1  ×  • NORMAL NORMAL	ALL NORMAL
2  ×  • NORMAL CARRIER	50% NORMAL, 50% CARRIERS
3  ×  • NORMAL AFFECTED	ALL CARRIERS
4  ×  • CARRIER CARRIER	25% NORMAL, 50% CARRIERS 25% AFFECTED
5  ×  • CARRIER AFFECTED	50% CARRIERS, 50% AFFECTED
6  ×  • AFFECTED AFFECTED	ALL AFFECTED

3 POSSIBLE TYPES
OF INDIVIDUALS

 NORMAL
 AFFECTED

 NORMAL APPEARANCE

MENDELIAN INHERITANCE

A taint which is hereditary will be transmitted according to definite laws. The chart shows how such a taint may "skip a generation" entirely.

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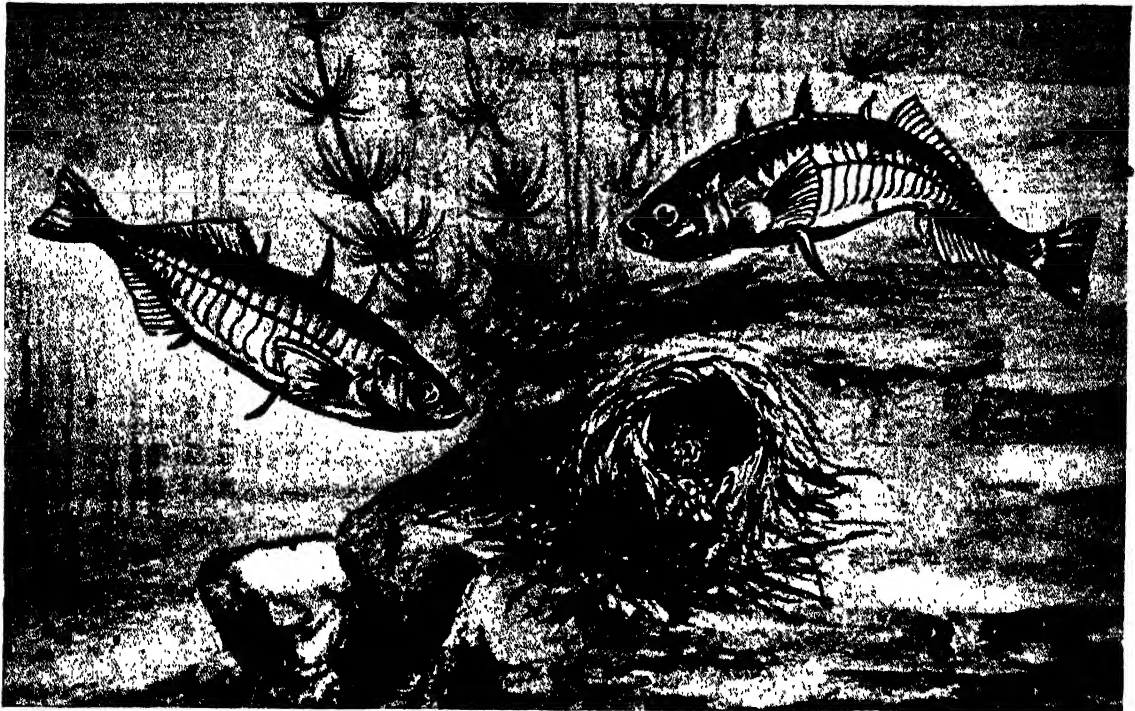
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keeps back bacteria. These "filterable viruses" or "filter-passers" are the smallest of known living creatures; they cause many diseases such as "foot-and-mouth" disease in cattle, distemper in dogs, measles in children, and many maladies in plants. The weak things of the world often confound the strong!

Two of the larger many-celled parasites have been already mentioned -hookworm

A consideration of the different kinds of disease *from the biological outlook* suggests three important ideas. (1) In two ways

Disease has lost much of its old no mystery. In the first place, it is often recognisable as a plus or minus alteration of the ordinary chemistry of the body, or sometimes as a harking back to a primitive and biologically out-of-date way of doing things, or sometimes as a



COMMON STICKLEBACKS AND NEST

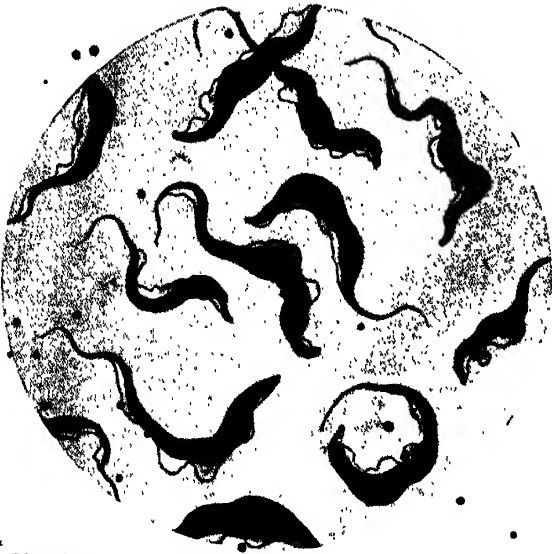
[James's Press Agency

The male stickleback builds a nest for the eggs of the female, binding together pieces of water-plant with a glutinous secretion from the kidneys. Such a secretion, natural to the male stickleback when breeding, would be evidence of disease in an ordinary animal.

and bilharzia (or *Schistosomum*)—but their name is legion. Many of them, such as tapeworms, which float in their food, have escaped from the stringency of the struggle for existence, and show the degeneracy that is often associated with thoroughgoing parasitism, but others, like the intestinal threadworms, are far from being inactive, show no marked degeneracy, and might, we think, be described as predatory animals attacking their host from within, just as ordinary predatory animals devour from without.

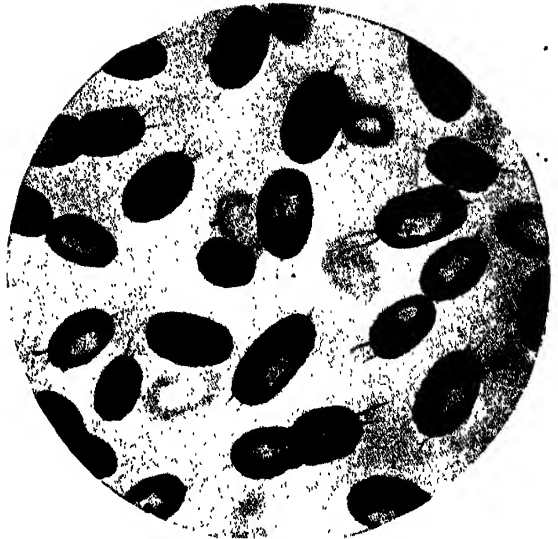
defect in the regulatory or endocrinal system. In the early history of the germ-cells there is a certain amount of chance in the shuffling of the hereditary cards, technically known as the *genes* carried by the *chromosomes*, and there is also a certain amount of chance in the meeting of a particular sperm-cell and a particular egg-cell; and thus deficiencies are apt to occur from time to time. A kitten may be born without a tail, or a puppy without hair, or a calf without horns, or a child without any

. BIOLOGY AND HEALTH



[Photos by]

ANIMAL MICROBES CAUSING SLEEPING SICKNESS.



[James's Press Agency]

PLANT MICROBES CAUSING PLAGUE

The deadly disease, sleeping sickness, is caused by *trypanosomes*—minute unicellular animals conveyed to man by the tsetse fly. Bacteria—the microbes which cause many diseases, including plague—are minute unicellular plants. Biologists can now identify the different kinds under a powerful microscope.

pigment ; and less-marked peculiarities, due to a similar cause, are very common.

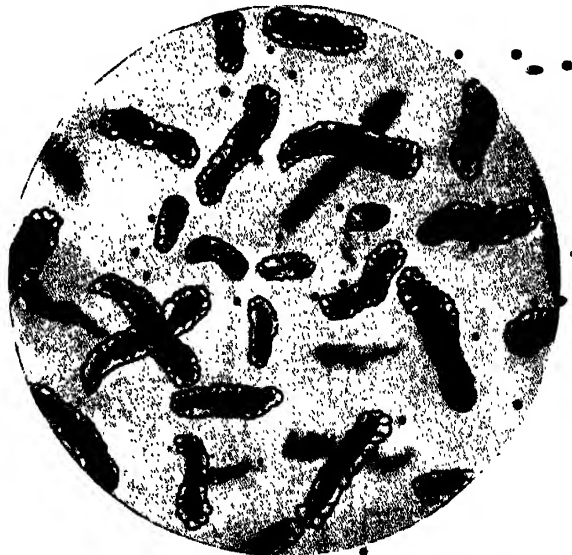
If any young creature crops up with a distinctly prejudicial peculiarity of germinal origin, what happens ? In the super-healthy conditions of Wild Nature the deteriorative

variation is nipped in the bud ; it is quickly eliminated, in almost every case, before it has reproduced its kind. But in civilised human society the unwholesome variation is sheltered and coddled ; it is often allowed to multiply its kind, handing on its deleteri-



[Photos by]

BACTERIA CAUSING TUBERCULOSIS



[James's Press Agency]

BACTERIA CAUSING DIPHTHERIA

These intruders, which cause such destruction in the human body, are gradually being brought under man's control. We see them here magnified to many thousands of times their actual size.

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ous peculiarity so that the number of the tainted increases inexorably. For the germinal variations are very liable to be transmitted to the next generation, though this is even more true for the good than for the evil.

But our immediate point is that disease has become more intelligible, and that means increased control. Disease is no longer a mysterious Power suddenly stretching its hands out of the darkness and clutching poor man by the throat. On the contrary, it may be due to a minute plant, or to a minute animal, or to a bigish parasite; it may be introduced by the bite of some insect, or by eating food badly cooked, or by drinking polluted water; it may be due to deteriorative surroundings or to bad habits—in short, since Pasteur's day, in particular, disease has become in great part concrete—something that can usually be stamped on. The old fatalistic attitude is now known to be unjustifiable—even in regard to consumption and cancer if early treatment can be secured. Even into children the idea should be instilled, that an ailment is not a thing to be acquiesced in, but a thing to be rebelled against and got rid of as quickly as possible.

A second thought to be pondered over is that apart from parasites, with which a give-and-take *modus vivendi* is often established, disease is extremely rare in Wild Nature. Under man's shelter it is common among domesticated animals and cultivated plants, though there it is being conquered, but in Wild Nature it is conspicuous by its absence. The chief reason for this is to be found in the progressive sifting effected in the course of the struggle for existence. There is a stern winnowing-out of variants in the direction of disease, and a positive fostering of variants in the direction of health and vigour. In civilised human societies, on the other hand, there is not only a toleration and a sheltering of the diseased, as rightly prescribed by the present conditions of public sentiment, but there is in many cases a permission to multiply, a dubious kindness

in the present, involving an inexorable cruelty to the future. We would emphasise the big fact that in Wild Nature there is almost no constitutional disease, almost no environmental, habitual, or nutritive disease, and very little in the way of microbic disease. And though wild animals and wild plants have many parasites, they are in most cases kept well under control.

The third big idea is that of biological control. In some places where diseases like malaria and yellow-fever were scourges, there is now none; in many regions where hookworm disease was recently rife, there is now only a slight incidence; the bacterial disease of diphtheria, till recently so fatal to children, has been more than half conquered; a subtle constitutional disability like sugar-diabetes has been greatly alleviated by the discovery of insulin, the internal secretion of the pancreas. This subject of the biological control of life requires treatment in detail, but the general point should be clear that, when man has the will, in other words, when he cares enough about it, he can remove many of the disease-handicaps that keep the children of men from advancing to something higher. It is largely through avoidable diseases, which can be stopped or counteracted, that man is kept bound to the earth, with neither vigour nor initiative to rise.

We have seen that biological science contributes to the improvement of the health of mankind—(a) by concrete applications to particular problems such as the checking of malaria, sleeping sickness, hookworm, and bilharzia; and (b) by great discoveries that have elucidated both health and disease, as in the case of hormones and vitamins. But there is a third kind of contribution, namely, the disclosure of foundation ideas, for lack of which clear thinking and progressive action may be seriously inhibited. What is familiar and fundamental to the biologist is not always an active principle in the thoughts and policy of the hygienist and the health-enthusiast. Let us illustrate.

To the biologist it is clear that in studying

BIOLOGY AND HEALTH

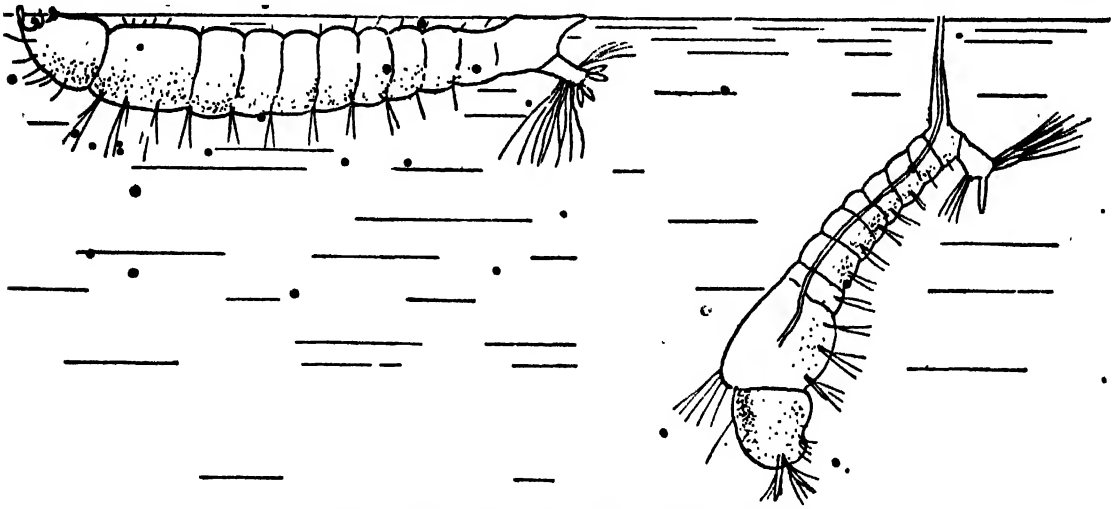
life we must always think of organism, environment, and functioning. In plain

English, there is the living creature itself, largely determined by the hereditary "nature"; there are all the surrounding influences, summed up by Sir Francis Galton in the term "nurture"; and there are the activities and inactivities of the living creature in relation to its surroundings. By "functioning" we mean not so much the everyday bodily activities of breathing and digesting and so forth, for it is not possible to separate these from our thought of the organism;

The
Biological
Prism.

While there are some biologists who occupy an extreme "behaviouristic" position, maintaining that organisms may be satisfactorily described and dealt with as if they had no "mind," or no "mind" that counted, like plants in short, there is more generally a recognition of the reality of a mental or subjective life which acts as a genuine factor in life—in the higher animals at least. While little progress has been made since Aristotle's day in regard to the relation, if it be a relation, between body and mind, many facts have been gathered that point

Body and
Mind.



FIGHTING THE MALARIA MOSQUITO

Mosquito larvae, which are hatched in water, attach their breathing-tubes to the surface film, as shown in this diagram of the common (right) and malarial forms. A thin film of paraffin on the water prevents this, and destroys the larvae.

we mean rather the activities and on-goings of the creature as a whole, its work in particular. As Geddes has pointed out, the sides of the biologist's prism—organism, function, and environment—correspond to the co-ordinates of the sociologist—Folk, Work, and Place. The important suggestion is just the commonplace—so often ignored—that in all health-improving plans we must think of the three aspects. What of good housing and bad food, or *vice versa*? What of a hypothetically fine breed living in a slum? What of wholesome conditions of work and a depressed state of personal health? If betterment is to last, it must be three-sided.

to the reality of the two sides or aspects or powers, and to the closeness of the linkage between them. According to some thinkers, the mind plays on the body like a musician on his violin; according to others, in the bodily and the mental, the objective and the subjective are two aspects of life, like the two sides of a shield, or the convex and concave surfaces of a dome. But, on either view, there are these two complementary ways of describing and dealing with life. At one time, especially in man, the inner life is more conspicuous, and we say *body-mind*, or *bio-psychosis*, as in thinking, feeling, and purposing. At another time the outer life with its metabolisms is the more con-

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THE MOSQUITO INFESTED PANAMA COUNTRY

The first attempt to cut the Panama Canal was a complete failure owing to the high death-rate from malaria.

spicuous aspect, and we say, as in regard to muscular work or digestion, *mind-body*, or *psycho-biosis*. But every one knows how indigestion may warp a philosophy or how good news may improve the digestion. The practical point is that in the pursuit of health we must never lose sight of the *unity of the organism*.

Another biological idea of great suggestive value is expressed in the phrase, "the curve of life," or the trajectory of life. Just as among the higher plants, annuals in

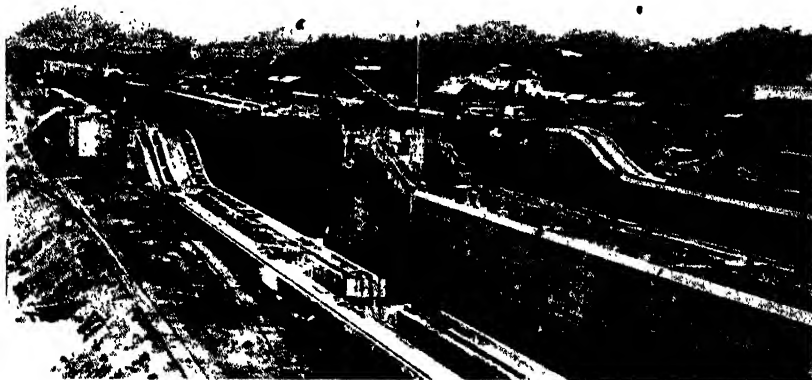
particular, it is usual and luminous to distinguish an ascending and a descending curve—sprouting, growing, leafing, flowering, fruiting, seeding, withering—so it is with life in general. The curve may be compared to an arched bridge with a short level stretch at the crest. There is developing, growing, strengthening, maturing, reproducing, weakening, and ag-

ing. In mankind the successive arcs of the curve are—*ante-natal* life, infancy, childhood, adolescence, love-making, marrying, parentage, declining, ageing, dying. Each arc must be thought of as modifiable in duration and intensity. Thus the youthful period may be lengthened out, as in the last half-century among successful classes; or old age may set in prematurely, as happens

when the struggle for existence is too keen or toil too monotonous. Our task, biologically stated, is to make the most and the best of each arc on our life-curve, including dying, and that success depends on gaining positive health both of body and mind.

Every biological problem, whether practical or theoretical, must be considered in the light of evolution. This is fundamentally important in connection with health, as a few illustrations

Evolutionary Setting.



THE CANAL NEARING COMPLETION

It was not until the biologists had conquered the malaria-carrying mosquito that this great engineering feat became possible.

' BIOLOGY AND HEALTH

will show. Man's body is the long result of time, and we inherit much from the pre-historic and the pre-human. Thus the very long intestine, especially let us say the colon or large intestine, is often an inconvenient remnant to-day, though it may have been adaptively useful long ago, when meals were irregular and the food included a large quantity of indigestible material. As man varies very slowly, he must obviously try to adapt his habits to his colon, for it is too sanguine to expect his colon to adapt itself to his habits. This must serve as an instance, but there are scores of cases where man becomes more intelligible in the light

of evolution, and where the practical promotion of health is furthered by the same illumination.

Positive health is a biological ideal towards which the human organism is moving, though somewhat spasmodically and not without relapses. How important it is to think of this ideal in connection with the known factors of organic evolution—namely, changing and entailing, sifting and singling.

In any case, the problems of health must be envisaged in the light of evolution, for evolution is going on, and it includes man in its sweep.

BIOLOGY AND EVOLUTION

By MARY G. ADAMS, M.Sc. (Cantab.), Tutor in Biology to the Cambridge University Board of Extra-Mural Studies.

FOR most of us, biologists or laymen, it is the first step which presents the greatest difficulty. Given the germ of life, most of us can imagine, although in the beginning we cannot fully understand, evolution taking place. But how did life first begin? Until the nineteenth century, special creation was considered a suitable answer, but evolutionary controversies and the work of Pasteur on micro-organisms reopened the question. Kelvin and Helmholtz suggested that some speck of life was brought to this planet in a meteorite, or among cosmic dust—a theoretic solution which simply shifts the problem to some other sphere. The modern view is that under especially favourable conditions on the young planet, life evolved from non-living matter. There is no evidence to-day, however, despite the most critical watchfulness, that such a process is going on under modern physical and chemical conditions. Chemists can make fairly complicated organic compounds from simple elements—



[L. Caswall Smith

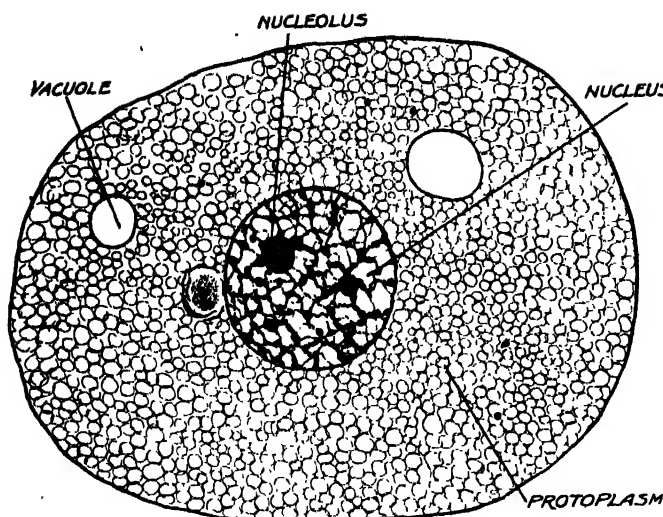
MARY G. ADAMS, M.Sc.

cocaine, indigo, oxalic acid, grape sugar—but the mode of manufacture throws little light on the primeval composition of life, and it seems probable that the modern laboratory will not be able to simulate these early experiments. Under existing conditions even the simplest known creatures, bacteria, arise from pre-existing organisms, and the day has gone by when mice and worms were confidently thought to grow from cheese and dirty

linen. Neither putrefaction nor fermentation will take place in substances which have been thoroughly sterilised to destroy existing life, and which are kept free from contamination.

For many reasons it seems probable that life originated in the sea—protoplasm, the elementary life stuff, contains several salts in the same proportion as they are found in the sea; the watery fluid of the blood is surprisingly like sea-water. We can imagine that life became more stable by a process of aggregation, simple molecules becoming more complex and forming association with

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A SIMPLE CELL

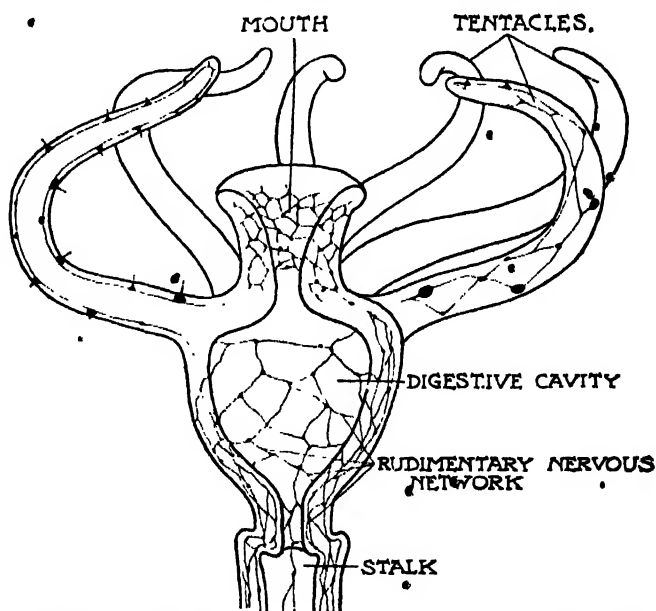
A section of a typical cell, which consists of a mass of protoplasm with a foamy structure surrounding a central nucleus. Inside the nucleus is a tiny, well-defined body (nucleolus).

each other in such a way that colloidal or glue-like solutions would appear. Ultimately physical or mechanical effects would lead to absorption and the deposition of material on the surface of the colloid. Relationships would thus be established between the colloid and the "outside world." In this way a simple "cell" would be formed.

From this point we can appeal to known facts for our picture of evolutionary consequence. **Appearance of Animals.** One-celled plant-like creatures, containing some substance like chlorophyll—the green colouring matter of plants—to enable them to make use of the sun's energy, were assuredly the first formed organisms. The first great step in evolution was the appearance of animals—unicellular creatures devoid of food-getting chlorophyll—they lived by devouring the plants, and ever since have been ultimately dependent on that same source for the continuance of their existence. The aggregation of these single cells into loose colonies must have been one of the early

experiments in evolution; there was mutual benefit in co-operative feeding and movement. Volvox—a plant, and Proterospongia—an animal, show such simple aggregations of cells.

Co-operation alone, however, is no great advance in organisation, but it makes possible a further step towards life on a higher plane, characterised by differentiation and division of labour. Certain cells of the colony become devoted to the function of movement, and they develop miniature oars; others take over protection and grow stinging hairs; others are organised for food-getting, like the tentacles of Hydra; others secrete digestive juices for the preparation of food. The obvious advantages of such co-operative effort make possible the operation of other beneficial devices—the race prospers as well as the individual; for surplus food and energy can be stored and capitalised in offspring. Very instructive are the different ways in which



After Håkane & Huxley

["Animal Biology": O.U.P.]

THE CELLS BEGIN TO ORGANISE

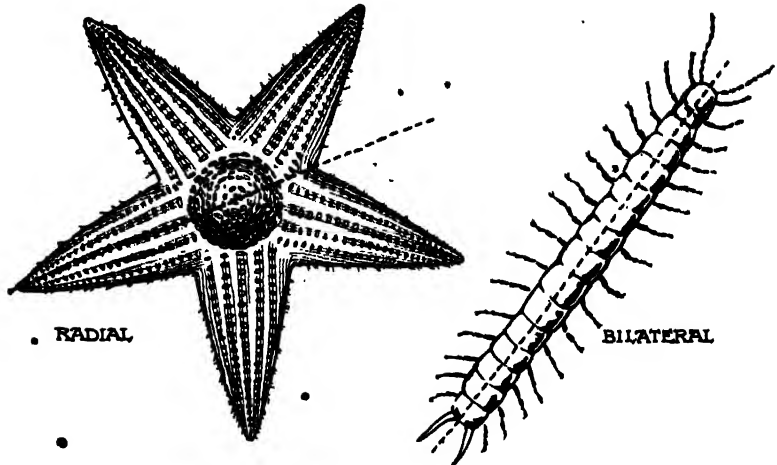
The freshwater hydra is here cut in half to show its mouth and digestive cavity. Cells are organised specially for food-getting, and a rudimentary nervous system extends to the end of the tentacles.

BIOLOGY AND HEALTH

parents seek to transmit capital to their children; the utilisation of the egg itself as a storehouse of food material, which reaches its climax in the egg of birds, is not different in principle from the carrying of the young within the womb and the later milk-feeding. The inheritance of property in a capitalist country is only another aspect of state protection under communism. The principle of *work* is as old as that of "capitalism." Moreover, life depends on the maintenance of energy relationships between the individual and its environment, and this is work. Life, therefore, is work of a peculiar kind, and the cessation of work is death.

As the crust of the cooling earth shrank, so its crumpling and buckling brought about land conditions, and a new chapter in evolutionary history.

Some creatures remained, as they do to this day, dwellers in the deep sea or on the shore fringes; others colonised the fresh waters. The pioneers, however, invaded the land and became adapted to an entirely new set of conditions. The adventurous worm deserves our gratitude; his investigations opened new possibilities of conquest. *Radial symmetry*, as exemplified in the jelly-fish and star-fish, was left behind; worm-like creatures showed the advantages of possessing a head-end and a tail-end, a left and a right side, and *bilateral symmetry* became the fashion. It can be readily understood that the habit of moving with one part of the body always in front, constantly experiencing first impressions of external objects, would lead to the specialisation of this part for the reception of stimuli. Head brains were the outcome of this early land habit, and with them the evolution of sensory and muscular co-ordination. Land



A FURTHER STAGE IN EVOLUTION

Animals such as the star-fish, showing *radial symmetry* (i.e. which can be divided into similar halves by many different lines passing through their centre) are sluggish, and generally live in water. Compare these with the more advanced worm or centipede, through which only one line can be drawn dividing the creature into similar halves (*bilateral symmetry*). They are active and forward-moving, showing the first beginnings of one centre of control—the head.

conditions also demanded a more efficient system of locomotion. In the sea there was little difference between plants and animals in this respect—earthly life solved the fate of plants; they were fixed, and their speciality in evolution became a *flair* for intensive colonisation, extreme adaptive specialisation, and beneficial associations.

Animals made rapid advances, however. They specialised in locomotion; limbs raised their bodies from the swamp; muscular feet gave rapidity and precision in chase and flight; wings conquered the air; burrowers, climbers, swimmers, punters, gliders—each became expert. Life on land was risky, too: temperature fluctuations were more violent than in water; frost and drought and flood had to be guarded against. Protective coverings were evolved—waxy shells, scales, feathers, skins, hairs, clothes. The oxygen supply became a difficulty under such conditions; internal surfaces, such as *lungs* or branching air-tubes, appeared in order to capture and burn sufficient oxygen to support vigorous life. A voice was developed as an adjunct to sex needs or parental cares. Reproductive habits became increasingly efficient as competition grew fierce. Associations for mutual benefit and protection



[Courtesy]

[American Museum of Nat. Hist., N.Y.]

A STAGE IN THE EVOLUTION OF BIRDS

This creature (*Hesperornis*) was an early water bird without wings. It was nearly 5 feet long, had teeth, and swam with its feet.

between different species became a feature of land life; large scale communities and societies arose, their individual members absolutely dependent on the corporate life of the whole.

When we inquire what motive force lies behind all this colonisation, this adaptation, in spite of risk and danger, this Survival of Fittest. ever-increasing perfection of form and function, we are uncertain of our answer. Animals took to the air because the land surface was crowded; they left the water because the pools dried up; they survived to leave offspring because less well-equipped competitors died out; but at the same time there was self-assertiveness and curiosity; there was experimenting and adventuring. Success went to those who resisted, instead of acquiesced, to the swimmers, not the drifters, to the adaptors and the successful co-operators. The animal with the greatest capacity for experimenting, testing, and storing his experiences is man, and with these qualities rests the possibility of future progress. Safety first has not been his watchword. Over-specialisation has meant extinction for many species in the past; the flipper or the hoof is more or less dead from the viewpoint of evolution, and not to be compared in value to the hand of man. Man is both competitive and

co-operative, sympathetic and self-sufficient, individualistic and socialist.

Looking back on evolution, the keynotes seem to be the production of a variety of types; secondly, their adaptation to a changing environment; and thirdly, the racial survival of those most fitted to survive. Thus we get evolution by the operation of *natural* causes. Civilised man is severely testing all these principles, but especially the last—the survival of the fit.

Under modern conditions the sifting of natural selection has practically disappeared; the unhealthy do not die; the weak, stupid, wasteful are sheltered by a kindly society. This tender-heartedness, sentiment, blindness, call it what you will, gives cause for grave



[Courtesy]

[American Museum of Nat. Hist., N.Y.]

AN EARLY LAND BIRD

The giant bird of Wyoming (*Diatryma*) was much heavier than an ostrich, though not so tall. It could not fly.



British Continental

MONSTERS OF THE PREHISTORIC AGES

Animals of great size and little brain marked one of Nature's experiments in evolution. These reconstructions, in the Carl Hagenbeck Park, near Berlin, are based on the evidence of actual remains.

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concern. Man has freed himself from the operation of a great natural law, and, in discarding Nature's great sieve, is sowing seeds of infinite complexity. The weak are supported; the defective allowed to beget children; the selfish suck the pooled inheritance. The worst feature of the situation is the strain thereby thrown on the conscientious and efficient. The young are underpaid and lack leisure and early independence; the eager and ambitious break their back for bread when they would have education. We have here only another illustration of the interrelationships in the web of life; destroy mosquitoes and you get rid of malaria; introduce rabbits into Australia and new types of vegetation replace the old. The great scheme of interrelations worked out in the course of ages is being modified in a few centuries by man's instinct for meddling. And at present we have not enough knowledge to make that meddling safe.

Man's emergence is part of the story of the evolution of backboned animals. All the great classes of vertebrates—fishes, amphibians, reptiles, birds, mammals—are linked in an ascending series, and many of them make contributions to man's bodily structure and leave their imprint on his physiological needs. Let us see how some of his possessions are represented in other vertebrates: fishes have skulls and jaws; amphibians—fingers, toes, lungs, a voice, and a movable tongue; the crocodile has a four-chambered heart; birds and mammals are warm-blooded; and mammals show the intimate association of mother and child, both before and after birth.

Man's instincts go back further than the caveman or the hunter; they spring from a common animal stock. It is still to the animal instincts of self-preservation and sex, hunger and love, that we must go in order to comprehend man's strongest urges. Danger, which calls into being the instinct of self-preservation, is followed by the emotion of fear in bird and ape as in man. The instinct of play leads to useful experimenting in kitten as well as baby. Man

stands apart from animals chiefly on account of his power of conceiving general ideas and using them for his guidance in behaviour and conduct. Language has helped him to do this, and enabled him to preserve and crystallise his ideas in institutions, laws, arts, and sciences. He thus possesses a unique power of accumulating tradition and profiting by past experiences. Other animals, it is true, are social, and some have undoubtedly built up a social tradition—wolves, birds, elephants, for example. But the social tradition of such animals is based on instinct, and tends to become rigid and hide-bound. Man alone attempts to construct his social fabric on reason, and therefore opens the door to developments in social organisation. He is peculiar in other ways as well—his brain is relatively the largest on record; he walks erect, has a good heel and a well-developed calf, a large forehead, and a good-sized chin; his teeth are fairly regular, without long canines; his body is practically hairless. Many of his sense organs are less keen than those of other animals, but he has specialised in stereoscopic vision (the blending of the images from both eyes into one—thus giving an appearance of solidity). Sight triumphed over smell, and touch became separated from nose and snout, and concentrated in the hand. It is the versatile, free, exploring hand which has proved such a signal success. Moreover, this change led to important improvements in the brain.

We do not know how man derived from the anthropoid ape stock—the link is missing—obscured by a million years of earth's history; we only know that in the cradle of the human race, Central Asia perhaps, several distinct types of mankind arose; but of these only one species survived. The probable factors in his emergence, and the story of his early social arrangements, are a fascinating chapter in his history. His descent from the trees as the forest shrank undoubtedly stimulated him to seek new ways of support. He became hunter and explorer; he made shelters and

BIOLOGY AND HEALTH

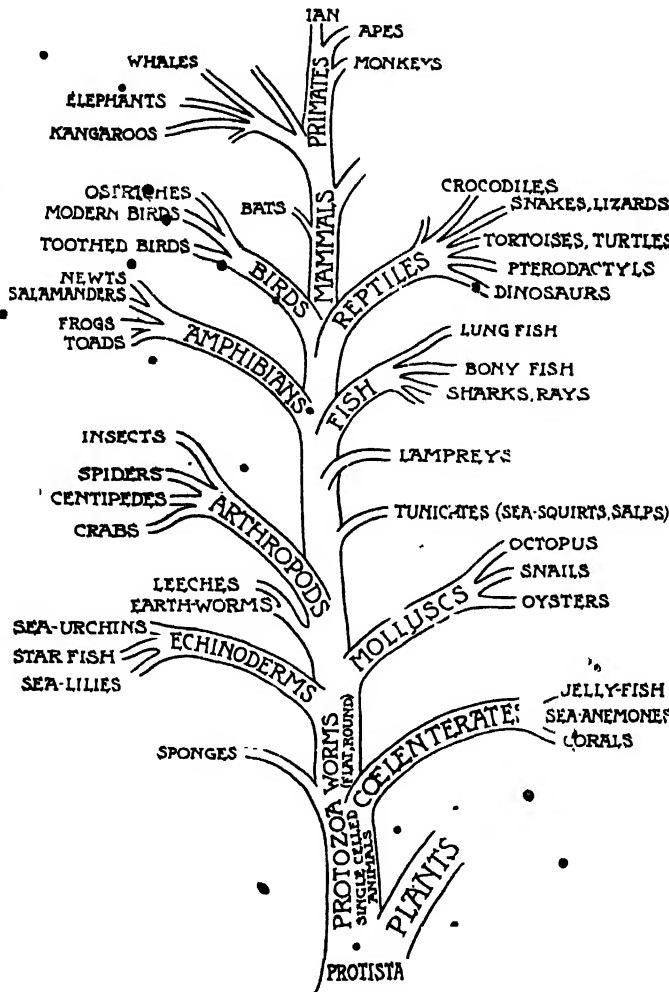
donned protective clothing, and roamed in bands for mutual defence. He was not as strong as other animals, but he was cleverer ; he made tools instead of using his hands. He discovered fire, and thereby opened up new channels of profit and refinement. The domestication of plants and animals marked another great step forward ; here was foresight against bad times. It also meant the accumulation of wealth — ownership and capital — and made possible social organisation on a large scale. The making of boats and the use of writing were epoch-making developments.

The modern study of "our contemporary ancestors" is extraordinarily illuminating : information brought in by field-anthropologists and explorers is throwing important evidence on our cultural history. There is still much of "the caveman within us," and our limitations, peculiarities, prejudices, repressions, have their origins in primitive society. The story of the evolution of morals should make us less complacent and conservative, more cautious and understanding in our ethical judgments. Our inability to detach ourselves from the personal aspect is a

legacy from the past which still burdens our loyalties and hinders our co-operative enterprises. There are signs, it is true, that disinterestedness and rational thought systems are making their way in our civilisation ; we punish the crime rather than the criminal ; we recognise the importance of

heredity, good as well as bad ; we are becoming dissatisfied with reasons which do not fit the facts and philosophies at variance with natural law. "Goodness" has become relative.

Our attitude to modern European marriage systems is a case in point. There is a growing tendency to regard such systems of sexual conduct as legalised customs adapted to suit particular needs, and not as rigid laws, fixed in time. A study of marriage customs of primitive peoples at different levels of culture shows that man was almost certainly primitively monogamous, i.e. he confined himself to



THE TREE OF EVOLUTION

This reconstruction of the tree of evolution shows the probable interrelationships of the great families of animals. It is possible, but more difficult, to reconstruct an evolution tree for plants as well.

one wife, like many other mammals, e.g. reindeer, squirrel, mole, seal, and hippopotamus (certain of the apes are polygamous, but often return to monogamy in adverse conditions). This is true of man also—fighters and hunters can only support one wife ; more wealthy agricul-

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THE EVOLUTION OF MAN (I.)

These skulls of prehistoric man are arranged in order of time from left to right: *Pithecanthropus erectus*, the nearest to the ape; Piltown man; Neanderthal man, the extinct species found in Europe; still with low cranium, heavy chin, and poorly developed jaw; Cro-magnon man, prehistory's nearest approach to modern man.

tourists can afford two or more, especially when most of the manual work is performed by the women. Undoubtedly the widespread habit of marriage is due to the success which it confers on the rearing of children, the father as protector, the mother as nurse, the elder children teachers and playmates. It is clear, as Westermarck says, "Marriage is rooted in the family rather than the family in marriage." The pooling of wives is not an uncommon practice in certain tribes, but this is generally a sign of extreme poverty. One outstanding reason for the prevalence and success of monogamy, apart from the growth of ethical considerations

and the sentiment of love, is the existence of approximately equal numbers of men and women.

HEALTH OF PRIMITIVE MAN

There is a tendency at the present time to idealise the health and vigour of primitive man, to picture him living under natural, i.e. uncivilised, conditions, as constitutionally robust, of fine physique, immune from nervous diseases, dying of accident or old age, and not from senility or infantile disorder. What are the facts? First, it is probable that the average standard of con-



Photos, Courtesy]

THE EVOLUTION OF MAN (II.)

(American Museum of Nat. Hist., N.Y.)

Reconstructions by Professor H. J. Macgregor of primitive man, based upon the skulls above, which are built up from fragmentary remains discovered in different parts of the world.

BIOLOGY AND HEALTH



[Grogan, Antrim]



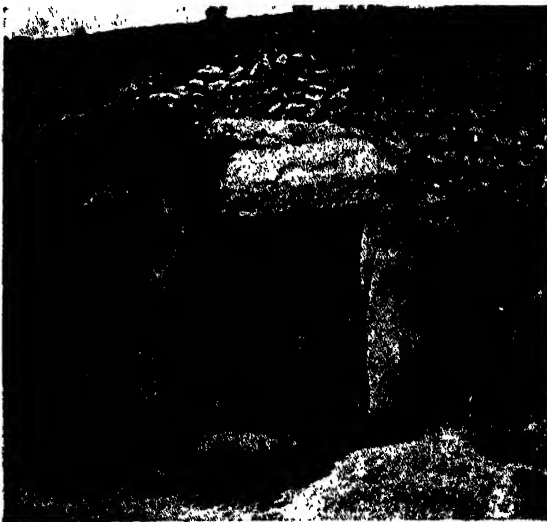
[Unterwood]

HOW PRIMITIVE MAN LIVED

Present-day survivals, showing the mode of life of early man. *Left*, a coracle, one of the earliest boats, still used in Ireland and Wales; *right*, pile dwellings in the Malay States, resembling those of the Neolithic period discovered in Switzerland

stitutional fitness was considerably higher than our own; weakly individuals were eliminated by natural selection. Secondly, many diseases, such as influenza, measles, diphtheria, etc., seem to be of relatively recent origin. One could not catch chicken-pox in the Stone Age because, from what we know, the micro-organism or germ causing such a disease had not then evolved. Thirdly, primitive man had leisure and time for rest and recuperation; he had abundant fresh air, and sunlight was allowed to reach all parts of his body; his diet was simple, and chiefly raw; there was no deficiency of vitamins. He probably suffered

from indigestion however, for his meals were irregular, and he often over-ate. His senses were not overburdened by useless and confusing impressions. Exhortations to buy, read, travel, or gamble troubled him not—his time was occupied with simple and useful observations; he was naturalist, artist, and toolmaker. His sex life was generally satisfactory—that is to say, satisfied. *He* was never without wife; *she* without either husband or protector. Late marriages, deferred on account of delayed economic independence, were unheard of! There was little overcrowding, and no population problems. The number of children was



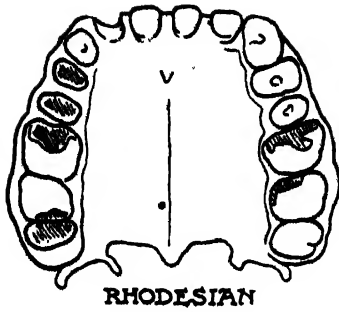
[Gibson & Sons]



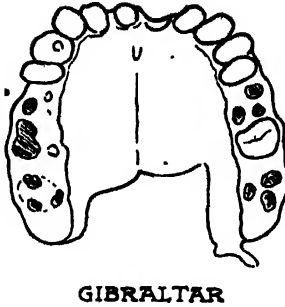
BUILDINGS OF EARLY MAN

Showing a primitive grave near St. Just, Cornwall, and the remains of an ancient British village near Penzance—a very complete example.

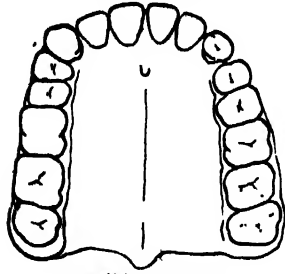
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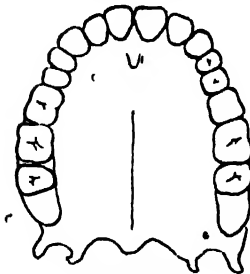
RHODESIAN



GIBRALTAR



AUSTRALIAN



ENGLISH

DENTAL DECAY IN PRIMITIVE MAN

A reproduction of the palate of Rhodesian man, compared with the Gibraltar palate, that of a male Australian aborigine, and of a rather small, modern Englishman. The decayed areas are shaded. From *Antiquity of Man*, by St. Arthur Keith (Williams & Norgate).

made to fit the territory and the food supply. One cannot but regard with admiration early man's recognition that Population Control methods must be devised for checking the increase of population and keeping it within subsistence level. Infanticide or child destruction and abortion and prolonged abstention from intercourse were crude methods perhaps, but there was an awareness of the problem which is rather instructive for our own rather blunted biological consciousness.

There is another side to the picture, however. Life was hard; cold and famine took their toll; a sanitary consciousness had not been developed, and new conditions resulting from conquest or migration were not met easily. The Australian aborigine was rapidly exterminated by contact with the white man. Woman suffered more than man; she was old at twenty-five, and often discarded at the end of her child-bearing usefulness. Moreover, Keith has shown that decay of the teeth was a disorder of Rhodesian man. This is interesting, because it is generally

thought that toothache is a modern ailment brought on solely by artificial diet. The drawing on this page is an illustration of this fact. There are clearly early evidences of disturbance of the palate bone. In modern peoples the wisdom teeth are rapidly disappearing. Over 20 per cent. of English people are without them; there are overcrowdings and irregularities of teeth eruption correlated with a narrowing of the face and contraction of the palate into a high arch. Such badly spaced, irregular teeth are increasingly liable to caries. But Keith believes that were modern men to resume a "Stone Age" diet, their teeth and palates would again be moulded in the ancient manner. "The same investigator has shown that Rhodesian man suffered from rheumatism, and probably had

severe ear abscesses." Historic man—that is, man whose recorded history is revealed to us in writing, picture, and stone over the last six thousand years—was also a sick man sometimes. Early records show surgical appliances, instruments, consulting rooms, medical practice. Pictures are given of the operation of trepanning, and very ancient skulls show such artificial punctures which have healed before death.

It is true that modern primitives do not suffer from cancer or appendicitis—two of our modern scourges—but they rapidly succumb to tuberculosis and syphilis. On the whole, then, the health of early man may have been overestimated—we have lost much, it is true, but we have gained much. Modern medicine can patch so effectively that the rent can hardly be seen. The invention of spectacles alone has doubled the effective working life of our adult population since the Middle Ages!

A "return to nature" is impracticable, but a return to simpler conditions—more air, more sun, and less unnecessary luxuries—is an object worth the price of "comfort."

BIOLOGY AND HEALTH

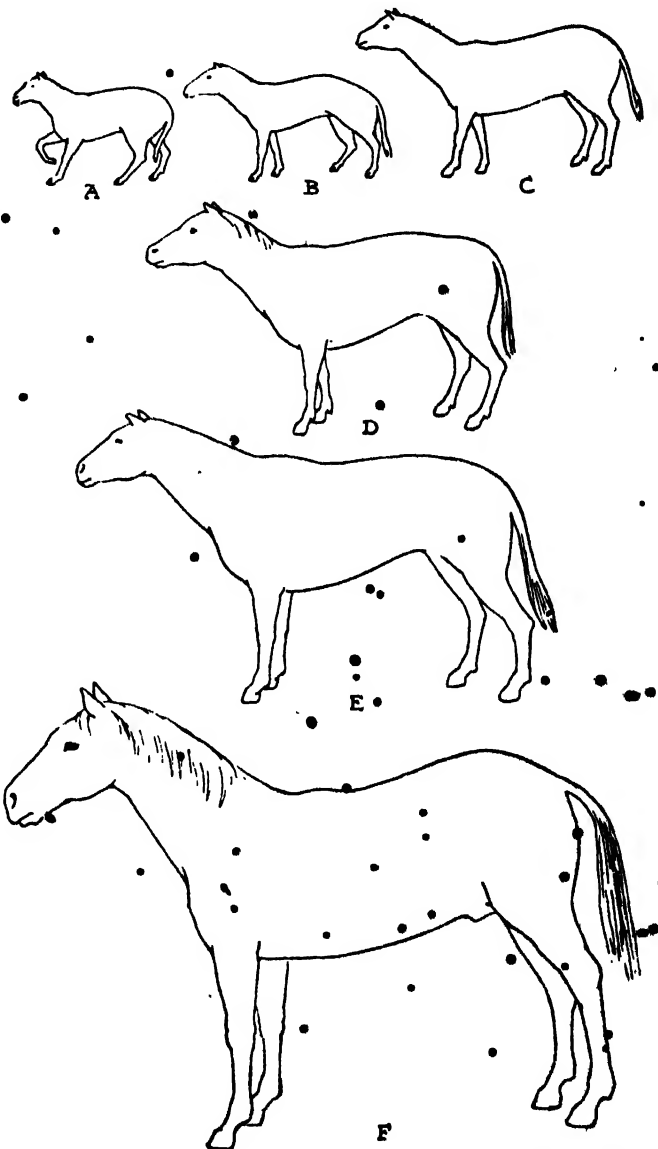
EVIDENCES OF EVOLUTION

Darwin's statement of evolution in 1859 was, in reality, a setting forth of facts; and appended to that magnificent Darwinism survey was an attempt to explain those facts by reference to a universal law, the law of Natural Selection. Let us glance first at the facts—facts accessible to all, though disconnected and inexplicable until Darwin's synthesis. There are four main sets of facts which offer themselves as "evidences" for evolution.

Firstly: The fossil record. Imperfect but conclusive evidence of a linked chain of organisms, plant and animal, rising in complexity throughout geological time. The record of the rocks allows plenty of time—anything from 100 to 500 million years—for the development of man from the simple inhabitants of the sea in early Cambrian times. Looking backwards, we see the history of man, in fossil bones and skulls, give place to small primitive mammals; before mammals, great reptiles had triumphed over the simple amphibia. To reptiles we owe much, our four-chambered hearts, our embryonic coverings, and our warm blood; these were some of the successful experiments of our reptilian ancestors. Before amphibia there was land without backboned animals, only fish in the sea to represent our vertebrate stock: and in the beginning of the fossil record no fish, but only backboneless marine animals and green sea plants. A remarkable sample of the value of fossil evidence can be seen from the pictures of the ancestry of the modern horse.

Secondly: Evidence from resemblance. All plants and animals are classified into groups, each group having some general plan of organisation; for example, backboned animals, or flowerless plants. Within each large group are smaller divisions based on

fine resemblances in structure. It is impossible to look at a frog and a toad, a hare and a rabbit, a buttercup and a celandine, and not see their fundamental relationship and ascribe to them a common origin. Yet this natural grouping into families, genera, species, had no evolutionary meaning until modern times. Moreover, living organisms clearly have fossil relations, forms now extinct (see the drawings below); while



(After Lull)

THE EVOLUTION OF THE HORSE

Outline drawings of horses of different geological periods, showing relative size. The time occupied in the development of our modern horse from its remote ancestor is probably six million years.

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some present-day species have continued an uneventful existence from early fossil times; a little lamp-shell (*Lingula*) has maintained itself unchanged for millions of years.

Thirdly: Evidence from comparative anatomy. The same ground plan of structure remains in spite of different functions in the forelimb of a dog, in the flipper of a whale, in the wing of a bird, and in the arm of a

man. In his own development from a fertilised egg-cell, man "climbs up his own genealogical tree." Race-history is mirrored in personal development. In the first place, man begins as a single cell; during early development he is a ball of cells; then he is a cellular cup; these stages are the same in a fish as in a man.

After this, however, the young human embryo seems to pursue a very round-



(courtesy)

[American Museum of Natural History]

EOHIPPIUS, THE ANCESTOR OF THE HORSE

Eohippus seems to have evolved in Western Europe, and to have migrated via North Asia to America, where fossil remains have chiefly been found. It had four toes on the forefeet and three on the hind, but only the large middle ones now remain, having developed into the hoof.

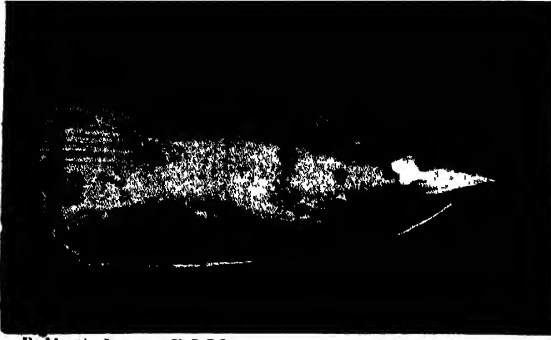
man. Bone for bone, there is remarkable consistency of plan, with minor modifications according to the particular adaptation of the limb in question.

Anatomy also furnishes another clue, namely, vestigial structures. The appendix, rudimentary tail, gill-clefts in the developing embryo, hairs on the body, and third eyelid in man remind us of when these useless organs had a function in other animals.

Fourthly: Evidence from embryological develop-

ment. In his own development from a fertilised egg-cell, man "climbs up his own genealogical tree." Race-history is mirrored in personal development. In the first place, man begins as a single cell; during early development he is a ball of cells; then he is a cellular cup; these stages are the same in a fish as in a man. After this, however, the young human embryo seems to pursue a very round-

• BIOLOGY AND HEALTH



[F. Martin Luncan, F.Z.S.]



[James's Press Agency]

LIVING RECORDS OF THE PAST (I.)

Present-day species, surviving from early fossil times, are important links in the chain of evolution. The lamp-shell (*Lingula*) has remained unchanged for millions of years; and the African lung-fish shows how the early land animals worked their way out of the water, for during the dry season it buries itself in the mud, its gills go out of action, and it breathes with the swimming-bladder instead.

sooner than the infant ape that clings for months to its arboreal mother as she springs from tree to tree.

The last set of evolutionary facts concerns blood-relationship in a literal sense. Transfuse the blood of man into dog or rabbit or calf—there is produced an inharmonious mixing—a destruction of red blood corpuscles. But mix the blood of man and ape, and there is a gentle mingling. This physiological method of testing relationship is subject to many technical refinements, and can be used to show the degree of relationship between different groups of animals with uncanny precision.

The facts, then, clearly show that evolution has taken place. But how? Darwin's answer was bound up with the ideas of over-production, variation, adaptation, struggle

for existence, survival of the fit, and natural selection. One of the most striking, universal, and perplexing phenomena in nature is the prodigality of life. Not only are all parts of the world populated, the cold, dark, deep sea, hot springs, rocky mountain tops, dry wind-swept deserts, but life is there in bewildering variety and profusion. Moreover, nature's breeding powers seem without limit. Fish lay anything up to 50 million eggs during the breeding season. If a single oyster and all its descendants for four generations could be left to multiply in peace, their shells would make a pile eight times the size of the earth. It is merciful that no living creature ever exerts its reproductive capacity to the full. Clearly, a very large proportion of this potential life is

Explanations of Evolution.



[F. W. Bond, F.Z.S.]

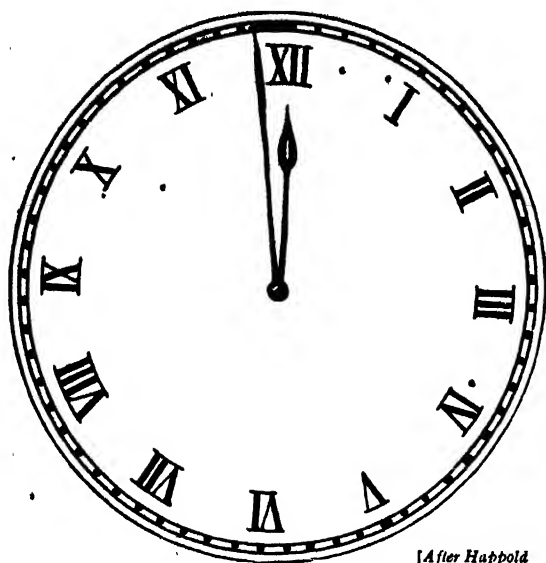


[W. S. Burridge, F.Z.S.]

LIVING RECORDS OF THE PAST (II.)

The duck-billed platypus (left) is a very primitive aquatic type of mammal which lays eggs. The echidna, or porcupine ant-eater (right), is another early survival which also lays eggs. Both these animals are found in Australia to-day.

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[After Happold]

HISTORY'S BRIEF SPAN

If the entire history of man on this planet (say 250,000 years) were represented by one journey of the big hand round the clock, then his *written* history (say 6000 years) would only be about 1½ minutes. Thus 30 seconds ago Cæsar invaded Britain: 2 seconds ago Waterloo was fought.

never realised—myriads of sex-cells never meet, fertilised eggs and tiny embryos perish in their first hours as food for other organisms. Of the six or eight developing worms in a single capsule, only one cannibal emerges.

What characterises the successful ones?

Darwin believed that they possessed "adaptive" variations which enabled

Natural Selection.

them to fit into their environment, to triumph in the struggle for place and food over less well-equipped competitors, and consequently to live and leave offspring. In other words, they were "selected" for survival. The twentieth century stresses the co-operation which goes on in nature—co-operation between organisms against the rigours of climate and shortage of food supply rather than the competition which spells extinction for the weaker; but the Darwinian conception of a negative "sieve" permitting the strong, clever, or fertile to pass through the meshes for survival and keeping back the weak, unadaptive, infertile, from leaving offspring, still describes one of the effective forces in bringing about progressive evolution.

The survival value of adaptation brings us to modern controversy; the fish is adapted to life in water, but there are sea-water and fresh-water fish, there are deep sea phosphorescent fish, flat fish like soles or skates, elongated fish like eels, flying and leaping fish, all surviving by various adaptations; one kind of snake survives by turning a tooth into a syringe and defending himself with poisonous saliva, another retains his teeth but possesses a skin which deceives his enemies into thinking he is his deadly brother, another grows a special spiny egg-opener to take the place of his teeth. In truth, remove the adaptations, and what have we left? There has been elaborate mimicry, protective deception. There has been extreme specialisation, limiting the species to a restricted

environment; and perhaps not very coveted environment; the tape-worm is adapted for life in a food canal, and quickly dies in a less easy environment. Specialisation, whether of behaviour or structure, is a dangerous practice in evolution, and is not necessarily bound up with progress. Specialisation means a closer and more precise adaptation to the needs of life, but progress implies general efficiency and ability to change in response to altered conditions. For that reason, man's place in nature is more secure than that of the horse. In fact, the horse has probably only survived because of his useful linkage with domesticated man.

There are types of specialisation which have resulted in retrogression; there is evolution downwards as well as upwards. This chapter of degenerative specialisation has features of particular interest to man; for it often shows itself in parasites. The habit of "settling-down," of leading the sedentary, unadventurous life, is often a sign of degeneracy in nature.

Evolution shows clearly that success is generally accompanied by resource, energy, experimenting. Darwin thought that small adaptive variations could be summed up to represent great changes in the course of geological time, and that the origin of one species from another could thereby be

BIOLOGY AND HEALTH

explained. He believed in "sports," or sudden changes, such as can readily be seen in a breeders' pen or a seed merchants' garden. He also implied that modifications

acquired during the lifetime of an individual could be passed on to its offspring and so make adaptive changes heritable. But the principal

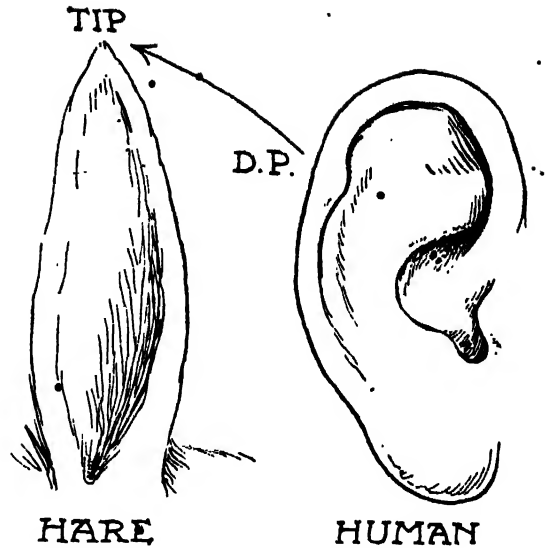
champion of the belief that acquired characters are inherited was the French eighteenth-century biologist, Lamarck. The modern disciples of Lamarck believe that environment can "dent" the organism, and that the children inherit the "dents."

The theory looks so obvious that it passed almost unchallenged until the German

Weismann concentrated attention on the fact that there was no known mechanism for transmitting the modifications of the "body" of the individual to the "germ-plasm" or sex-cells which alone took part in racial history. The theory is still the centre of violent controversy, but as yet no satisfactory method of modifying the germ-plasm has been discovered. It is true that recent discoveries have made it appear possible that hormones might act as the stimulators, but their effects in modifying the sex-cells have still to be demonstrated.

NATURAL SELECTION IN MAN

We have seen that progress is not the inevitable order of things; the downward path has been followed in many organisms in the evolution of life. Are we sure that man's own position is unassailable? Much has been heard of our deteriorating inheritance; the problem of racial decadence is much in the public eye. What light can the biologist throw on this question? We have no reason to suppose that the rise of man in the evolutionary scale has been due to the operation of any factors essentially different from those which have been responsible for the evolution of lower animals. Man owes his early progress to selection. How is selection working at the present time? Has man escaped the operation of this natural law? Or has his civilisation



A RELIC OF MAN'S EVOLUTION

The odd little kink in the human ear (Darwin's point) can only be explained by reference to the prominent tip on the ears of some of our remote ancestors.

provided substitutes for strength and survival which are just as effective in securing progress?

In the very early history of man there was probably intense struggle and a lively elimination of the unfit. Rivalries led to wars of extermination in which the unfit had little chance, or to single combats in which the strong killed the weak. Modern civilised warfare tends to eliminate the best blood, for, on the whole, the unhealthy, cowardly, and mercenary remain behind to perpetuate their kind. Moreover, victory goes to the weaker, better organised, numerically stronger groups—and the vanquished may possess innately superior qualities—a high, less warlike culture, gentle values, and more sensitive artistic tastes. Not that the victors inherit the earth, but their military success may retard human progress! Then sexual selection has altered considerably. The modern husband no longer has a trial of strength, courage, and endurance before mating. The present surplus of women, the practice of strict monogamy, the emancipation and education of women—all these factors tend to leave some women, often the intelligent, energetic types, without husbands or without children.

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[E. Step]

I.



II.

[... Step]



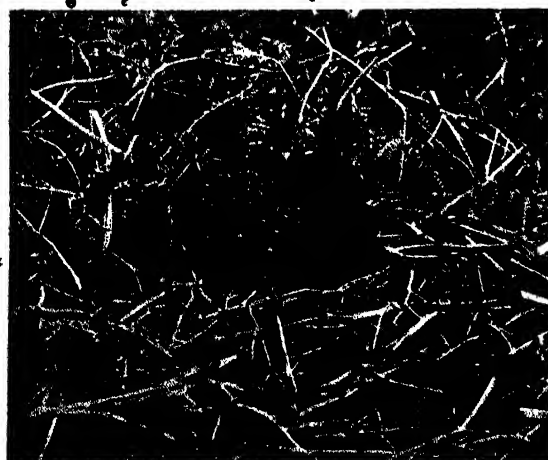
[E. Step]

III.



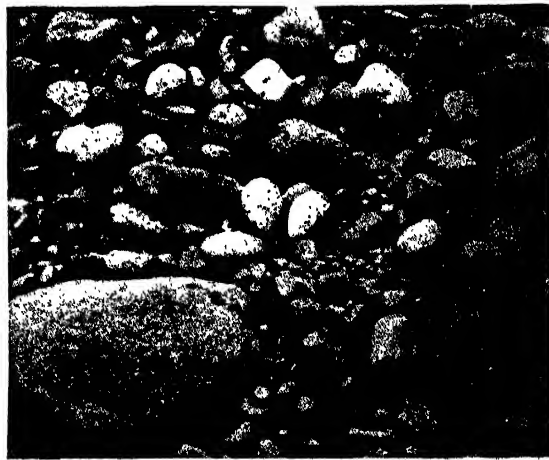
IV.

[W.S. Berry]



[R. Chislett]

V.



VI.

[R. Chislett]

HOW NATURE'S SUCCESSES SURVIVE

The creatures which survive in the battle of life are those which can best protect themselves and adapt themselves to changing conditions. How this is achieved may be seen above. I. and II. show stick and leaf insects which mimic their usual resting-places so that enemies cannot see them. III. A harmless, viperine snake with a skin like that of the poisonous viper. IV. An egg-eating snake that has developed an egg-opener in place of its teeth. V. and VI. The protective colouring which hides the red grouse and the eggs of the little tern.

BIOLOGY AND HEALTH

Modern sexual selection is a thing of very doubtful value. It is the custom among many primitive peoples to destroy puny infants, idiots, incurables, and other burdens to the community. Eugenics is by no means a modern idea. Our solicitous care for the deformed, foolish, insane, and degenerate is far from being a eugenic practice, although it is dictated by the growth of kindly enlightened sentiments. It is true that barbaric methods of elimination are out of fashion,

tised least where it should be practised most.

This uneven use of birth-control methods is, of course, only part of the problem of *differential fertility*—that is, the different rate of increase possessed by different classes of society. It is well known that the “educated” classes marry relatively late and produce few children, whereas the shiftless, improvident, feeble-minded, and ignorant have a birth-rate much above the average.



THE MIGRATION OF A TRIBE

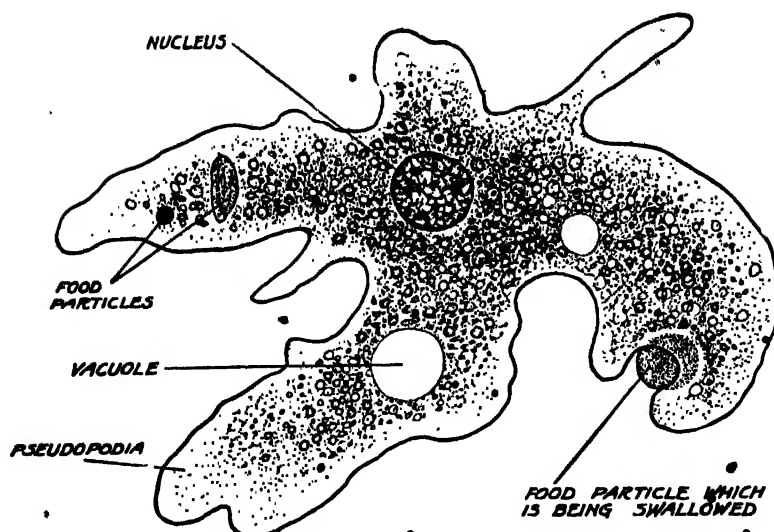
[From the painting by F. Cornon]

A picture eloquent of the struggles of primitive man.

but science has placed in our hands a valuable weapon for promoting race cleanliness. Methods of birth control, properly practised and used with courage and imagination, provide us with the most powerful lever ever invented for raising the standard of racial fitness. Naturally the use of such a weapon is fraught with uncertainty and danger, particularly when it is in the hands of authority and wealth. Its exclusive use by the intelligent and thrifty, and its withholding from the ignorant and wasteful, may well bring about a crisis in man's history. At present, birth control is prac-

Naturally it is important that we should not estimate the eugenic worth of a family in terms of wealth or social success; good blood may be associated with poverty and insignificance; but, on the whole, it is true that advances in culture have come from the upper, rather than the lower, levels of humanity. Evidence seems to show, too, that this is true of purely physical qualities—height, weight, constitutional soundness, etc. Genius, talent and ability generally succeed in establishing themselves; history has shown that it is difficult to obscure such qualities in spite of handicaps of birth, poverty, or position. And such good blood,

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THE SIMPLEST FORM OF LIFE

The ubiquitous amoeba provides a good example of a single-celled animal. In the diagram food particles may be seen being engulfed and in process of digestion. The creature moves by thrusting out parts of its body substance on one side and retracting on the other.

rising in the social scale, limits the contribution which it makes to the heritage of the next generation, while the population is replenished from mediocrity.

The first thing to do is to promote the growth of a eugenic conscience among our people. There must be a widespread recognition of the fact that we are responsible for the heritage of the next generation, and that the control of racial change is not a myth or a scientific dream, but is actually possible at the present time. Great alterations could be effected in a few generations. There is infinite variety in human material—differences in physique, mentality, and temperament;

we can, if we choose, select the beautiful, healthy, vigorous, and wise, and allow them to inherit the earth. It all depends on the types which are selected for parenthood.

THE LIVING ORGANISM

By MARY G. ADAMS, M.Sc. (Cantab.), Tutor in Biology to the Cambridge University Board of Extra-Mural Studies.

ANY attempt to define life generally ends in failure, or a resort to some philosophical argument which only confuses the issue. For the scientist who approaches the question from a common-sense attitude it is simpler to contrast living and non-living things. What do living things do which non-living things do not? It is clear at the outset that they can be distinguished by no rigid rule, and one suspects that the gap between them may one day perhaps be bridged with a more complete knowledge. For a great many of the questions which we pose to ourselves, unanswerable at first, may approach solution when our field of vision is extended. Even now, differences between plant and animal, species and variety, heredity and environment, matter and energy, are re-

ceiving a quantitative rather than a qualitative treatment. One factor about life is clearer than the rest—all living things are made up of a substance called "protoplasm"—the physical basis of life, as Huxley called it. The attributes of life, then, are the attributes of protoplasm—growth and reproduction, irritability, and cyclic development.

Eighty years ago Von Mohl gave the name "protoplasm" to the jelly-like substance always associated with the manifestation of life, whether of plant or animal. We are still ignorant of the nature of protoplasm, though we are beginning to learn something about its physical and chemical properties. We know that it is a colloid, probably a mixture of a fluid in a solid jelly, in consistency rather like the white of

Protoplasm and Cell-structure.

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an egg. By its own weight it will spread out over the surface of a glass slide. When looked at through a microscope it is colourless or whitish, and contains many darker granules, making it opaque, like ground glass. These granules or particles of food—consisting of minute globules of oil, and aggregations of inorganic material—are always on the move.

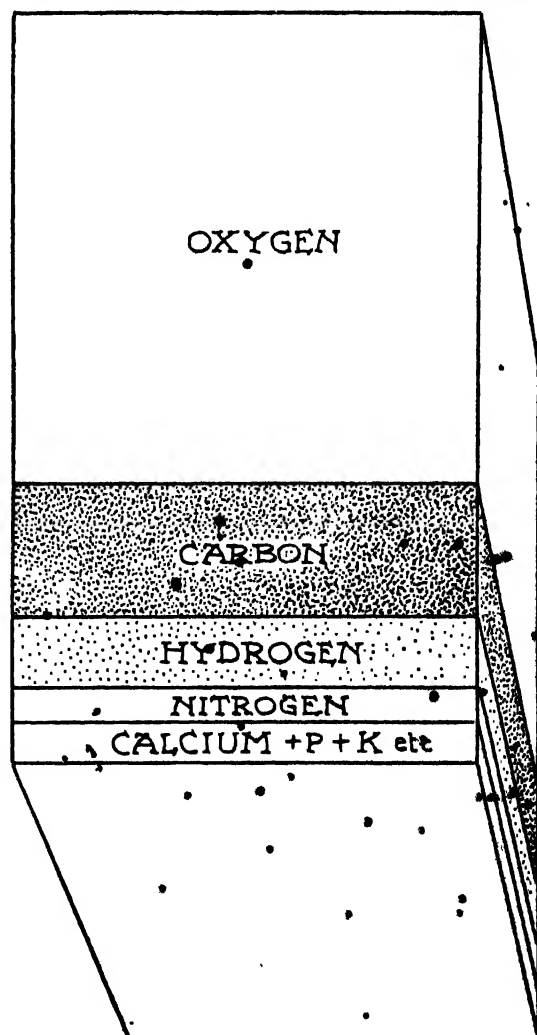
An analysis of dead protoplasm shows that it consists, to a large extent, of proteins, the most complex of carbon compounds. Protoplasm can be looked upon as an extremely complicated emulsion of proteins, fats, carbohydrates, and mineral salts in water. One very significant fact has been brought to light by chemical analysis, namely, protoplasm only contains the same chemical elements from which non-living matter is built; these are carbon, oxygen, hydrogen, nitrogen, and small varying quantities of sulphur, phosphorus, calcium, magnesium, potassium, and iron (*see diagram on this page*).

These elements are united into molecules of a far more complicated nature than any compound in the inorganic world. Protein molecules consist of hundreds or even thousands of atoms, and consequently it is easy to understand how very variable protein molecules can be. Probably slight differences in the atomic composition of proteins hold the secret of "*specificity*." For, although the protoplasm of the millions of plant and animal species are apparently identical, they must present slight differences in the chemistry of their contained proteins. An analysis of dead protoplasm, however, omits the most striking characteristic of life, which is *change*. Living protoplasm is never static; parts of it are being broken down, and other parts reconstructed. There is constant wear and tear. One can express this in terms of chemistry by saying that the atoms themselves are constantly altering their position in the molecules. It is probably true to say that, when this constant interchange ceases, the protoplasm is dead.

Just as, for all practical purposes, the chemical unit is the atom, so the biological

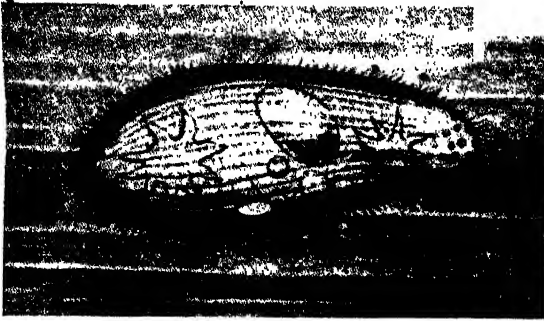
unit is the *cell*, and it is to protoplasm organised into cells that we must look for an idea of how living things work.

The Amoeba. The simplest plants and animals are single cells. Higher organisms consist of millions of cells. But cell life is fundamentally the same whether the creature consists of one or many cells. The study of the cell aggregates of a creature like man can only be properly appreciated by an investigation into the life of a single cell. The ubiquitous amoeba provides a good example of a single-celled animal. Under the microscope its body is seen to consist



THE ESSENTIAL ELEMENTS OF LIFE.

The diagram shows the proportionate amounts of the chemical elements in protoplasm, the substance of which all living things are made.



[Ames's Press Agency]

A SIMPLE ORGANISM

The paramecium, a unicellular animal which swims rapidly by means of the rhythmical beating of the tiny hairs which project from its surface. Unlike the amoeba, it has a definite mouth, which is not visible in the picture.

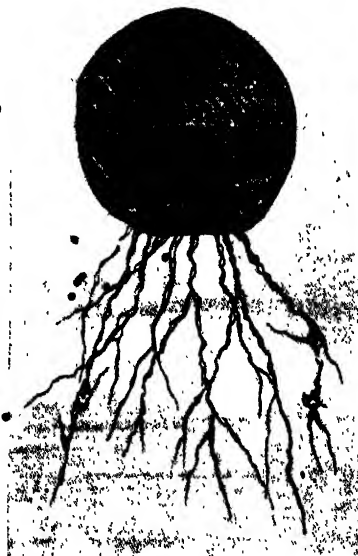
of protoplasm with no enclosing wall, irregular in shape, and constantly altering. The creature moves by thrusting out lobes of protoplasm on one side and retracting part of its body substance on the other. The animal engulfs food as it flows along. Two lobes are thrust out enclosing the food, living or dead, in a temporary "stomach." Digestive fluids are passed into this stomach, the contents of which become first acid and then alkaline (just as in the human stomach and intestine). The food is dissolved and absorbed by the surrounding body. Any indigestible refuse is cast out. Here is a very simple kind of digestion with little apparatus. In the same way the animal breathes without gills or lungs, taking in oxygen and giving out carbon-dioxide over the whole surface of its body. It also excretes without a kidney, squirting out water and waste products from a contractile sac.

The amoeba is also irritable, that is to say, it has the power of responding to stimuli—an important property of protoplasm which enables the creature to come into relation with its environment. In

making effective response lies the secret of adaptability. An amoeba will move away from some stimulant which it dislikes, and will coil up into a ball in order to present the least possible surface to water through which an electric current is passing. As well as responding to external stimuli, the amoeba acts with apparent purpose. It will reject some foods while accepting other kinds. The nature of this apparently purposive response is still a mystery.

Embedded in the protoplasm is a nucleus, a more solid ball of protoplasm, which can be stained or dyed very readily. No cell is completely organized without a nucleus, and a bit of isolated protoplasm cannot live long without one, for the nucleus seems to control the building up of new material from the food taken in and to act as director of reproductive processes. The chromosomes of the nucleus are the bearers of the hereditary characteristics.

Reproduction in amoeba is very simple. The nucleus splits in two; a thin waist of protoplasm appears, becoming so thin that it snaps. One animal has become two, but there is no corpse, for each daughter



[Ames's Press Agency]

TYPICAL UNICELLULAR ANIMALS

The hairs on *Gromia fluviatilis* (left) are adapted to aid in locomotion. *Diffugia proteiformis* (right) has a hard outer skeleton. Most unicellular animals are microscopic in size.

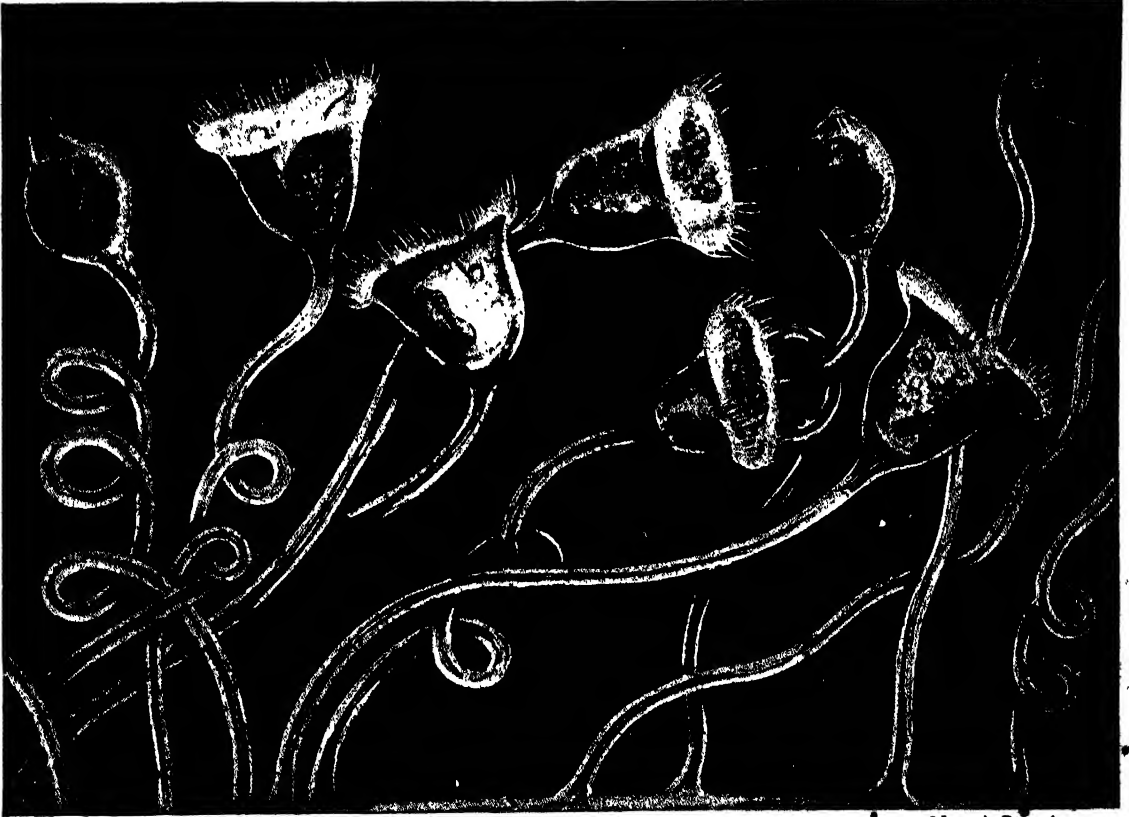
. BIOLOGY AND HEALTH

cell moves away, growing and dividing again during favourable circumstances, resting and lying low when times are bad. Thus it seems that unicellular animals are immortal. They certainly do not die in the sense that higher animals die.

The possession of a body worth having by the more highly organised plants and animals is therefore paid for by the surrender of "bodily immortality."

organs, a mouth, or a rudimentary foot. Some have elaborate methods of sexual reproduction. Plant-cells are organised on the same general plan, except that they are generally delimited by a firm cell wall of a material called *cellulose*. The feeding of plant-cells is fundamentally different from that of animal-cells, and, on this account, most plant-cells contain chlorophyll.

Bacteria are single-celled plants of simple,



[James's Press Agency]

THE SINGLE-CELLED VORTICELLA

The Vorticella, or bell animalcule, is a single-celled animal which lives in colonies. By means of fibres, which contract in its long stalk, it can pull its bell-shaped head away from approaching danger. It reproduces very simply — by splitting longitudinally, one-half swimming away and attaching itself to another stick or stone.

There are many thousands of such unicellular animals and plants in water, air, and soil. Most of them are microscopic: all of them are limited in size. Some of them, however, are more complicated, and may possess long, drawn-out, protoplasmic hairs (cilia), which aid in locomotion.

Others have a hard outer-skeleton of lime or silica. Some have the beginnings of

but still obscure, organisation. Some cause disease in animals and plants, like *B. botulinus* and *B. tetanus*.

Many are beneficent, and all play an extremely important part in the economy of nature. The soil is full of them, breaking down and building up nitrogen compounds. They are the agents of putrefaction. The air is full of them. They infest all water. In commercial processes they are invaluable.

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They are the responsible organisms in butter-making, cheese-maturing, tobacco-ripening, and wine-fermenting. They multiply at an extraordinary rate, and it is fortunate that they are destroyed equally quickly. Their susceptibility to light has long been known. But only recently has the destructive power of ultra-violet radiations been used to check their multiplication—a discovery likely to have far-reaching consequences.*

All these unicellular animals and plants lead successful lives, if adaptability and

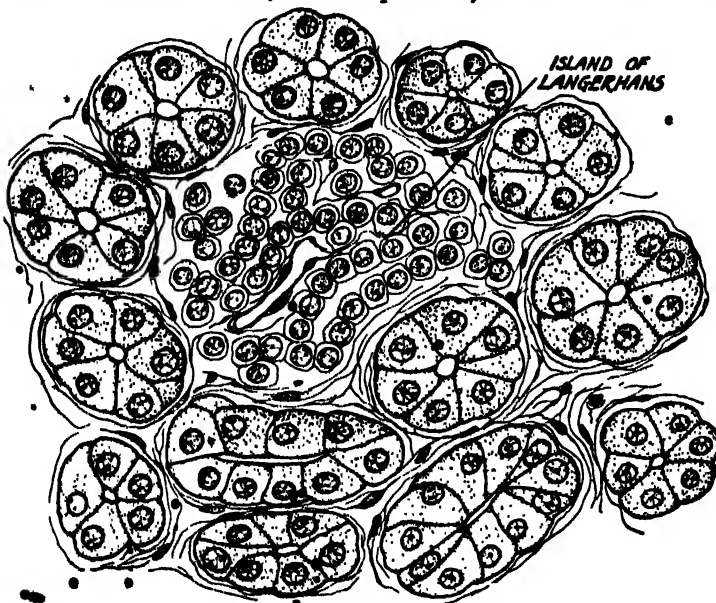
It is necessary, in order that life may be conducted on a higher plane, that many-celled plants and animals should be formed. Some animals consist of colonies of cells loosely dependent on one another, where the death of a few of these cells does not imply the death of the entire colony. This loose relationship eventually leads, in more highly organised creatures, to the intimate relationship of large numbers of cells all practically dependent on one another.

The single-celled amoeba is its own butcher, baker, and candle-stickmaker. It eats, excretes, breathes, responds, and reproduces. In higher forms these various functions are delegated to groups of cells united in tissue-formation. So, we get nerve-tissue, muscle-tissue, digestive, reproductive, and supporting tissue, consisting of cells of appropriate structure (see illustration at foot of the opposite page).

The problem which high organisms have to face is integration; in other words, how all these activities can be controlled and brought into line with the welfare of the organisms as a whole. But it must not be forgotten that the activity of the entire organism

is the sum of the activities of its component cells, and all life problems are, ultimately, cell problems. Senile creatures have worn-out cells. Embryonic or developing creatures have vigorous cells. Health implies healthy cells.

Perhaps the most obvious of all life processes is the capacity for perpetual change, and persistence in spite of change. The living creature, plant, or animal is for ever expending energy, and making good that expenditure. No living organism can produce energy—it can only make use of existing forms of energy. Nor can it produce



TYPICAL HUMAN TISSUE

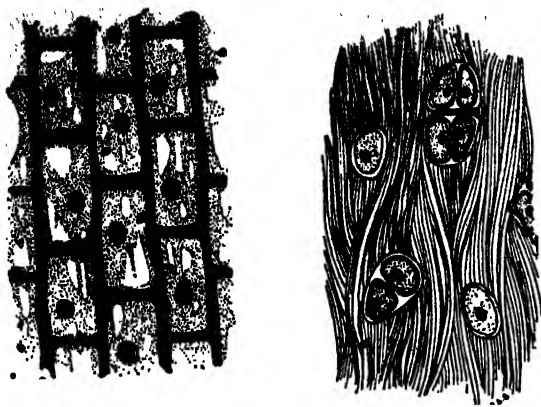
A section of the pancreas, showing the colonies of interdependent cells of which it is composed.

survival are taken, to indicate biological success. Some of them have probably maintained themselves in their present form for millions of years and represent the earliest phases of evolution. Nevertheless, they suffer from obvious disadvantages. Such organisms are largely at the mercy of their environment, an increase in their size is necessary for progress.

Some single cells, it is true, are very large. Hens' eggs are large, and these are twenty times smaller than the eggs of ostriches; but such cells are very specialised, and do not live independent lives.

*See section on "Sunlight and Health."

BIOLOGY AND HEALTH



Courtesy • ["The Human Machine," J. S. Bainbridge]
VEGETABLE AND ANIMAL CELLS

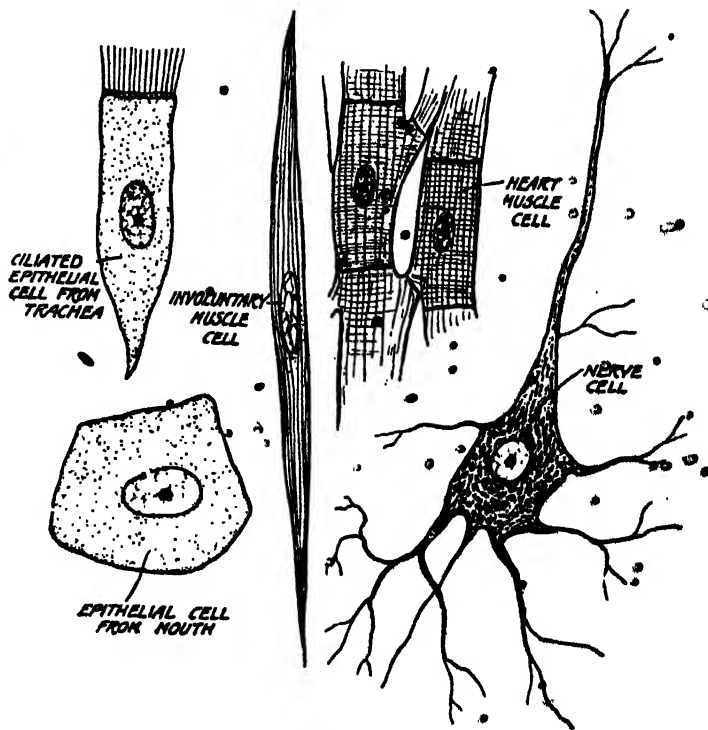
Showing a characteristic difference between vegetable (left) and animal cells (right). The former are packed closely together, and have thick cellulose walls, while animal cells are often far apart and have very thin walls.

matter—it can only utilise existing matter. The principle of the conservation of energy and matter holds good in the organic as well as in the inorganic world. All the food an animal eats and all the air it breathes can be accounted for. A proportion is excreted as waste matter; carbon-dioxide is breathed out; and some is retained for growth and repair. The income is equivalent to the expenditure together with the balance in hand. The body is comparable to a company. The directors may decide to utilise the profits by adding to the company's machinery or plant, by granting a bonus to different classes of shareholders, or by establishing a reserve fund in the event of bad times. In the same way the living organism, if young, employs its excess of income over expenditure by growing and adding to the parts of its living machinery. Or it may be specially generous to certain organs, to the brain for any ruthless demands made by it, or to the muscles for unusual activity. Or the reserve may be stored against old age or rough weather. This exchange

of material and transformation of energy is called *metabolism*, and clearly there are two aspects of metabolism—anabolism, the building-up processes; and katabolism, the breaking-down processes. The ratio $\frac{A}{K}$ expresses life conditions at any moment. If $\frac{A}{K}$ is greater than 1, the organism is growing and making headway. And if $\frac{A}{K}$ has a value less than 1, the organism is not making good its losses, and must eventually die.

The metabolism of animals and plants, although in essence the same, differs in an important way. All animals are ultimately dependent on plants, because even the simplest animals cannot directly utilise carbon from

the carbon-dioxide in the air, but must take in elaborated carbon compounds, already built up in the chemical laboratory of the plant-cell. Plants do not move about in search of food. Roots and leaves are bathed



SINGLE BODY CELLS OF MAN

In highly developed organisms different work is given to the different types of cells united in tissue-formation. Health implies healthy cells.

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in food, requiring neither mouth nor digestive apparatus for its assimilation. Food is absorbed over the whole surface of the plant body; consequently there is a large superficial area presented by leaves, stems, and roots. Water with mineral salts in solution, nitrates, sulphates, phosphates, etc., is taken in by the roots. Carbon-dioxide and oxygen are taken in by the leaves, and from these elementary substances simple carbohydrates are formed in the leaf, but only in the presence of the green colouring matter, chlorophyll, and in the presence of sunlight. In the dark, plants will not build up food materials. They lose weight (even though they may appear to "grow"). Non-green plants, like some bacteria and fungi, are in the same position as animals. They must be supplied with foods elaborated by green plants. In photo-synthesis, which, as the name suggests, is the building up of food in the presence of light, carbon-dioxide is taken in from the air, where it exists in minute traces, and, together with water from the soil, is manufactured into starch and sugar. This process takes place in the green chlorophyll—containing cells, whose pigment seems to act as a *catalyst* in effecting this building-up process.

Many of the most important processes in the animal body are carried out by catalysts, which are chemical substances present in minute quantities, remaining unchanged after the transformation they have effected. Hormones and vitamins probably have a catalytic action. One of the first stages in the manufacture of starch by the leaf is the production of a substance called formaldehyde. It is of considerable significance that recently formaldehyde has been artificially produced in the laboratory, and from it more complicated nitrogenous compounds can be formed. This process probably constitutes one of the first stages in the artificial production of elaborate food substances, which have hitherto only been manufactured by plants. Simultaneously with photo-synthesis a reverse process is going on. Plants breathe, that is to say, they take in oxygen and give out carbon-

dioxide, and there appears the paradoxical situation of the concurrent taking in and giving out of carbon-dioxide. Respiration, however, goes on always in light and shade, and in all parts of the plant, whether green or not. It has often been suggested that flowers should be taken out of a room at night, since, by their respiration, poisonous carbon-dioxide is being breathed out. But, unless one is sleeping in a greenhouse, this precaution is unnecessary, because the amount of carbon-dioxide breathed out by a few flowers is infinitesimal.

Plants also transpire, that is to say, give off water-vapour from their leaves. In order to get enough mineral salts from the soil, a good deal of excess water has to be taken in, and this is got rid of by the plant in much the same way as an animal sweats, except that pure water is given off in transpiration, whereas *sweat* is a mixture of water and nitrogenous waste products. Immense quantities of water are given off by plants; from an acre of forest land, some 15,000 gallons of water may be transpired in a day. This makes the air cool and damp and favours rainfall, a fact which is of great importance to man. But excessive transpiration is dangerous for the plant, and in vegetation in dry and exposed situations there are elaborate mechanisms to control the rate of transpiration.

By means of the transpiration current, nitrogen—essential to the building up of protoplasm—is absorbed in the form of dissolved nitrates from the soil. Air consists of four-fifths nitrogen, but, oddly enough, plants cannot derive their nitrogen from this source, and an adequate supply of nitrates in the soil becomes of fundamental importance in the economy of nature. Man, by his artificial manures, endeavours to make good some natural deficiency, though his work only supplements the activity of certain soil bacteria which "fix" the nitrogen of the air in such a way that it can be taken in by plants through their roots. Some of these nitrogen-fixing bacteria live in nodules on the roots of plants belonging to the pea

BIOLOGY AND HEALTH

family. So these plants are always included in any system of crop-rotation.

The food material thus manufactured is used up by the plant in growing, in laying up reserves of food, and in reproducing. Reproduction is a costly affair for plants, which cannot move about to effect fertilisation or tend their young, and it is not surprising that much of the energy of plant life goes to the production of an excessive number of offspring. A single foxglove may produce a million seeds, only one or two of which are destined to survive. Energy is capitalised in the seed, and the parent plant, on flowering, often dies.

Animals, on the other hand, whether plant-eating or flesh-eating, must roam for food, and their form and functions are in the main due to their ultimate dependence on plants for food. They must have a compact body and efficient organs of locomotion. They must have a digestive system which renders uninterrupted feeding unnecessary; and they must have an effectual way of disposing of accumulated waste products. Many animals in a state of nature enjoy a considerable respite between meals—a

natural truth over which man might well ponder! Since animals live at a higher rate than plants, the adequate elimination of waste becomes a matter of urgency. Some animals, it is true, are rooted like plants, but they live in water, and are not in the main line of evolution. It is necessary

to emphasise the fact that neither matter nor energy is gained or lost. Oxygen and food are taken in, carbon-dioxide and waste products are given off, and work is performed with the evolution of heat.

DIVISION OF CELLS

Sooner or later the cell, whether free or united in a tissue, must divide or die. Cell division is among the most intricate and difficult problems of biology, and if it were possible to understand the physics and chemistry of cell



A PLANT PARASITE.

Non-green plants, such as this fungus on a beech tree, correspond to animals in that they can live only if supplied with food from green plants.

division, then the biggest of life's problems would be solved. Naturally the question is being attacked on every front by an army of investigators, and the process has been described in the minutest detail for thousands of different kinds of organisms and types of cells. A chain of events has been observed remarkably constant in

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its several features for all dividing cells, plant or animal, simple or complex, but still the causes of these events defy analysis.

Briefly, when a cell divides, the nucleus is at first the centre of activity; the chromatin, of which it is made, emerges as a long coiled thread. This thread shortens, thickens, and divides up into a number of

rod-like bodies called the *chromosomes*. The chromosomes arrange themselves along the centre of the cell, and each one splits lengthways into two halves. There now appear in the cell some very remarkable fibres, which can be seen to radiate from two opposite points—termed the *centrosomes*—and which attach themselves to the chromosomes. The whole arrangement is now shaped like a spindle. The halves of the chromosomes separate and climb or are dragged up these fibres to opposite ends of the cell. Here they assemble, losing their identity, and two nuclei are reconstituted in appearance identical with the parent nucleus. A wall is

run up between them, and there are now two cells instead of one (see figure on p 323). The important thing to notice is that each daughter nucleus receives the same number of chromosomes as its parent nucleus possessed, and that this chromosome identity persists throughout subsequent cell divisions. The actual number of chromosomes varies from two to several hundreds, but there is a constant

number for every species of plant and animal. Moreover, there is continuity during division—continuity of protoplasm, of nuclei, of chromosomes. This complicated, indirect process of cell division is called *mitosis*, and it is only in very rare circumstances that cells divide by *simple fission*.

In higher multicellular organisms most

of the cells of the body have lost this

power of **Reproduction of Cells.** continued cell division; they

become fitted out with an array of cell furniture, strengthening bands, and stores of food, and are deprived of their plasticity. Or they may become loaded with poisonous waste products and slowly die. In this way millions of the cells of mature creatures become unfit for further service in the interests of growth. This generally does not occur, however, until the animal or plant has reached a certain limiting size, which is dependent partly on the "nature of the beast," and partly on the environmental conditions.

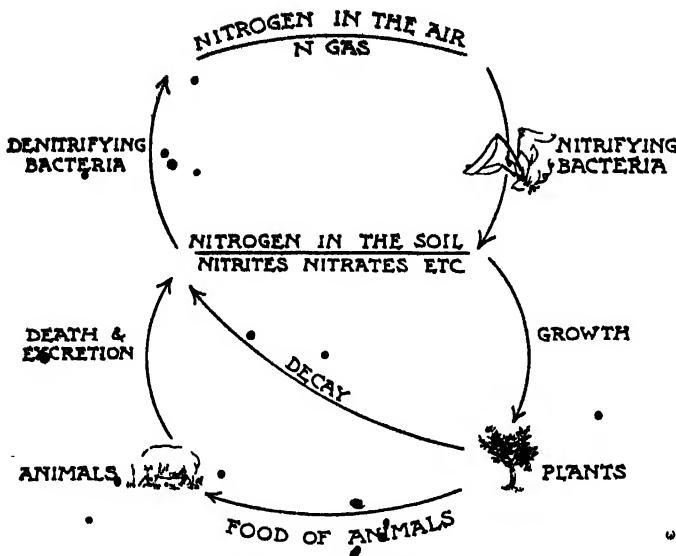


HOW BIOLOGY HELPS THE FARMER

Within the nodules on the roots of leguminous plants, such as this garden pea, live swarms of bacteria which enrich the soil by their nitrogen-fixing properties. For this reason leguminous crops (clover, beans, peas, sanfoin, etc.) are included in systems of crop-rotation.

In the amoeba we saw that this ultimate size was governed by the powers of diffusion in a single cell, and when this size is reached the amoeba normally divides into two individuals. In higher organisms this simple process is clearly impracticable. The business of dividing a motor-car with the engine running into two smaller cars would be a disheartening undertaking, but it would be child's play compared with the trouble of

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NITROGEN'S SHARE IN THE PROCESS OF LIVING

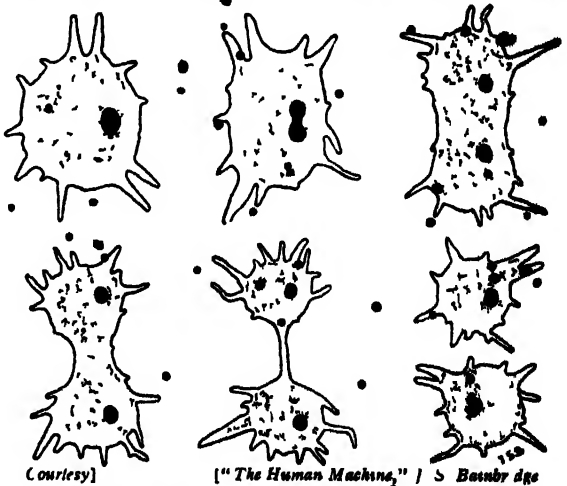
Showing how the gas nitrogen in the air passes through a cycle of changes necessary to living organisms. Man is now able to assist the nitrifying bacteria by "fixing" the nitrogen from the air chemically into the form of artificial manures.

dividing a goat into two kids. This difficulty is overcome in nature by arranging for reproduction to be done by certain cells which are kept specially pliable for this purpose, unhampered by the necessity for special adaptation. They are the germ- or sex-cells. The possession of these reproductive cells has, therefore, a twofold value; the future of the species is provided for, while the individual can indulge with safety in an orgy of adaptive specialisation. Complicated things, like feathers, can be formed and retained through egg-laying and chicken-rearing, whereas in simple unicellular animals, like amoebae, all the body is more or less melted up for reproduction. Thus, for the biologists, the individual consists of two parts—body-cells, or somatoplasm, giving us the trees we know or the man we speak to; and sex-cells, or germ-plasm, giving us seeds and children for the continuance of the race. There is a phrase made popular by that stimulating biologist, Weismann: "the continuity or immortality of the germ-plasm," which expresses the relation between the two parts; the germ-plasm, like the amoeba, is potentially immortal, but the body-cell, sooner or later, must die.

The strife between hen and egg for pride of place is promoted, anew by saying that the hen is but the egg's way of producing another egg.

Clearly, only those creatures which can reproduce efficiently will survive. Consequently, from the biologist's viewpoint, the successful organism is the one which leaves offspring, be they many or good. In the lower creatures very rapid multiplication is effected by non-sexual methods—by the budding of yeast-cells, by spore-forming in moulds and fungi, by tubers and runners in plants. Bacteria employ this method very successfully. But the most widely spread method of reproduction is the sexual.

There is hardly a group in the animal or vegetable kingdom where this method is not found. It seems safe, therefore, to conclude that the process is of great use. There are many ways in which sex appears to serve the organism. Perhaps the most significant is the union in sex fertilisation of two streams of germ-plasm, each with its own adaptations and peculiarities. In this way the individual resulting from sexual



(Courtesy)

["The Human Machine,"] S. Boserup

DIVISION OF A SIMPLE CELL

I Adult amoeba II The nucleus begins to divide; and (III.) the division complete. IV. and V. The protoplasm gathers round the new nuclei; and (VI.) breaks apart to form two separate complete cells.

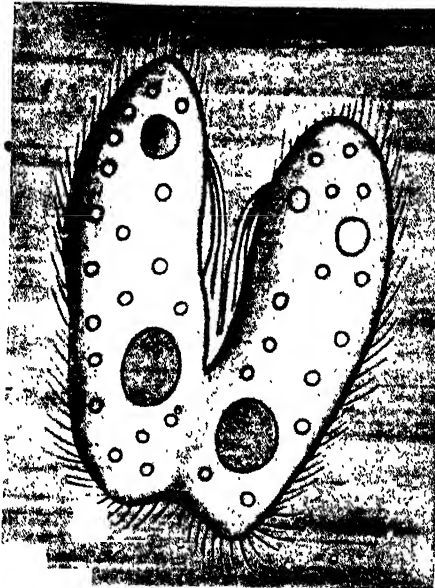
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fusion might find itself the fortunate possessor of two useful gifts, one from the father, and the other from the mother. This blending of characteristics is obviously of great importance in heredity.

Again, sexual fusion appears to give a stimulus to development. Worn-out, resourceless cells are replaced by young, plastic cells. Furthermore, sexuality often seems to be used as a protection against adverse conditions of the environment. Seeds appear to carry the plant through the winter, and often after famine or war birth-rate figures show an increase instead of the decrease that might logically be expected.

Early in evolutionary history the entire individual seems to act as a sex-cell or gamete; fertilisation here is the fusion of two individuals. Their protoplasts and nuclei become intimately commingled, and, after a period of rest, the single new organism goes on its way refreshed and reinvigorated.

As we pass in review animals and plants in an ascending evolutionary scale, we find certain tendencies clearly expressed. (1) There is a gradual delegation of fusion to special sex-cells, which later become differentiated into two kinds—small, active



[James's Press Agency]

PARAMOECIUM DIVIDING

Another example of a single-celled animal which reproduces by simply splitting in two.

vigorous males actively seeking the receptive females, made passive by food-storing habits. Nor is it fantastic to observe the same principle in man. The male, in his reproductive capacity, is amorous, pursuant, acquisitive, responsible for the support of the family; while the female is attractive, passive, and conservative, the quiescent vehicle of her expensive powers of reproduction.

(3) Fertilisation, at first a chance affair, taking place by the haphazard mating of male and female sex-cells in water, becomes less fortuitous when the female egg is retained in the body of the mother, and the male sperm is conducted to it by the activity of the male carrier. Moreover, when fertilisation



[E. Steg, F.L.S.]

FUNGUS, REPRODUCING NON-SEXUALLY

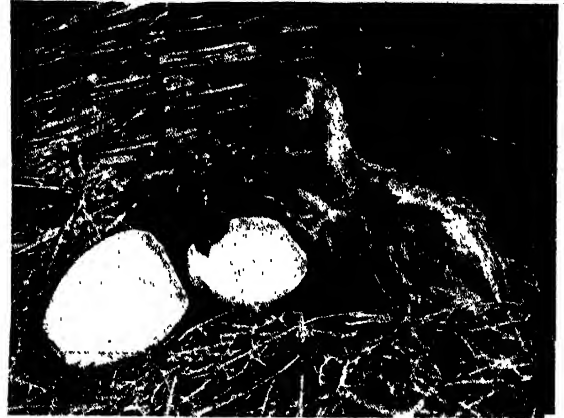
The spores of Bryant's Earth Star are blown about in the air and, when they settle on suitable soil, straightway grow into a new organism.

Sex and Reproduction.

BIOLOGY AND HEALTH



[E. Slep]



[W. S. Perri'ge]

THE SPAN OF LIFE (I. AND II.)

Is man of necessity limited to his "threescore years and ten?" The length of the life cycle and the emphasis on different parts of the curve from birth to death varies widely in nature. The silk moth (*left*) has a long-drawn-out youth and a short maturity. Whereas many birds, as the rhea (*right*), can support themselves soon after hatching.

has thus been effected within the body of the female, an opportunity is given for the young to undergo their early stages of development in this secure environment. This principle is still further extended

when the offspring is given ante-natal care and protection for an increasingly long period of time. Naturally, if adequate care is to be lavished on helpless, new-born children, they must not be very numerous. The rate at which flies can multiply is impossible for birds. An elephant cannot care for as many offspring as a mouse. Multiplication like rabbits is inexpedient for civilised man. The keynotes of the whole process are individual specialisations and division of labour, increasing economy and efficiency.

of production, and a progressively lengthy association of parents and children.

We have already said that one of the characteristics of living things is their *cyclic development*. An egg produces a caterpillar which be-

comes a
Life chrysalis
Cycles. and then

an egg-laying butterfly. The tadpole is followed, by the frog, egg, tadpole; and so with the baby — child, adolescent, adult, baby; acorn — seedling, sapling, tree, acorn. Always there is the climax of reproduction to give significance. Always there is the compromise between self-preservation and race-preservation. In many organisms self-preserving tendencies are decisively inhibited when repro-



[Underwood]

THE SPAN OF LIFE (III.)

Every phase of the elephant's life is protracted—considerable gestation, extended childhood, long maturity, and gradual decadence.

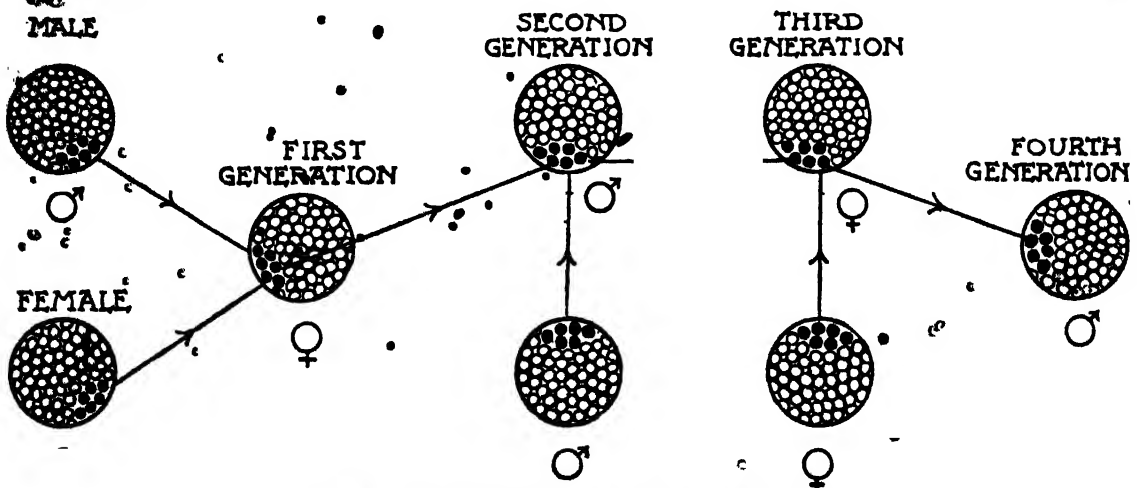
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duction has been effected. The plant on flowering often dies ; death alone will scatter the seeds. The moth, on mating, falls exhausted. Even the eel, slowly maturing for six or eight restless years, never returns from the deep sea spawning-grounds.

The life-histories of different creatures show emphasis on different parts of the curve from birth to death. Some creatures, like mayflies, have a long-drawn-out youth and a short maturity. Others, many birds for instance, can support themselves soon after birth and enjoy an actively reproductive life for many seasons. A protracted period is spent in every phase of an elephant's life—considerable gestation, extended childhood, long maturity, and gradual senescence. All higher life-cycles show this in common, however—a single fertilised egg-cell divides into two, four, eight, sixteen, until a mass is formed. Of these simple, undifferentiated cells a few remain primitively embryonic for subsequent reproductive purposes, while the rest become aggregated into specialised tissues. There is thus an early separation of germ-cells and body-cells. The body tissue cells may become extremely specialised during organ-formation ; witness the long contractile muscle-cells, the disc-shaped blood-cells, the hard bone-cells, and the

branched nerve-cells. After *differentiation* has been completed, there is a long period of growth, diminishing in vigour as the adult size is reached. Maturity is a phase of stability, no growth or differentiation, and only a declining power of renovation and repair of worn-out or injured cells. Then come senility and death. The duration of these developmental phases is of great importance to man. Long has he striven to extend the normal span of human life, to stave off ageing, consoling himself, now with a belief in spiritual immortality, now with an anxious care for future, unborn generations. His practical successes have been few. Medicine and applied science, it is true, have given him a greater expectation of life, lower infant mortality, and a more comfortable old age ; but an effective control of his life-cycle lies deeper than this. It lies in an understanding of the problems of growth and differentiation, of senescence and rejuvenescence.

Modern biologists are approaching the question from an experimental angle, investigating the conditions of growth and development, trying to alter the life-cycle according to plan. A very real advance has been made by an examination of the part played by hormones in controlling



HOW THE SEX-CELLS MAY BE IMMORTAL

Each large circle represents an individual made up of germ-plasm or sex-cells (black), and body-cells (white). In sexual reproduction, indicated by arrow lines, the sex-cells of two individuals unite into a common stream, in which the body-cells are not involved. Thus one of the cells of the parent lives on in the child, and there is an unbroken lineage of sex-cells from generation to generation.

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and directing development.*

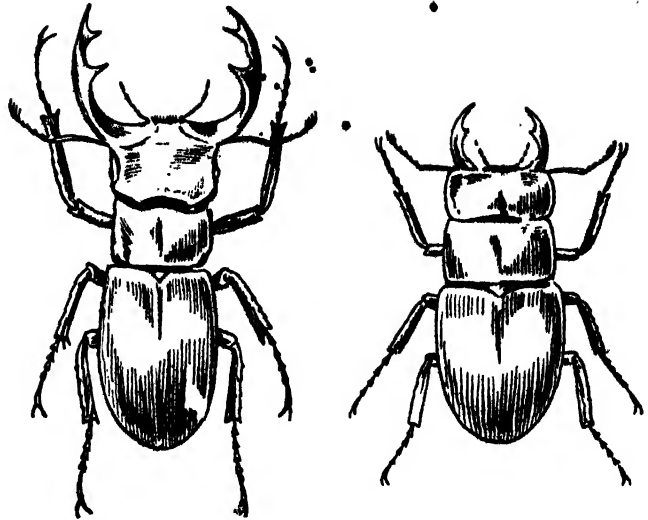
Secretions from the thyroid and pituitary glands seem particularly important in this direction. Young tadpoles, fed on thyroid-extract, will quickly change into frogs the size of flies. Tadpoles, with their thyroid glands removed, will not develop into frogs. So, too, puppies, whose pituitary glands have been extracted, grow very slowly and fail to develop adult behaviour. Temperature also effects the rate of development. It is well known that many bodily reactions go on more quickly and smoothly at higher temperature, and experiments show that frogs' eggs, incubated at low temperature, are tardy in their early cell divisions.

We have spoken of cyclic development in such a way as to make clear the importance of reproduction. In one sense,

Death and Immortality. If a man has a child, one of his cells lives on in that child, part of an age-long stream of immortal germ-plasm. In this sense man does not die. But natural death means something more than this to most of us. Most men are concerned to stave off death, and there is more than a theoretical interest in the question: "Is death inevitable?" Is death, in fact, an attribute of life? Frantic searches for the Elixir Vitae showed that the medieval mind was confident that an effective remedy against old age could be found. The twentieth century has seen a less assured resuscitation of the idea in the work of Steinach and Voronoff on rejuvenation by means of the ductless glands. Steinach by ligaturing the duct of the testis, has released sex hormones, bringing about rejuvenation of the organism as a whole.

Voronoff has grafted monkey-glands on man with the same end in view. Both have met with but limited success.

* See section on "Endocrines."



• A SIMPLE FORM OF SEX DIFFERENCE

Separate individuals for male and female are always found in the higher creatures. The male stag beetle (*left*) differs from the female in the size of its jaws.

The actual duration of life in different organisms is a matter about which surprisingly little is known. The age at which animals die in captivity is hardly a reliable guide. Elephants in a state of nature apparently live as long as two hundred years; the golden eagle fifty; blackbirds twenty. The big sequoia trees of California show, from their annual rings, that many were saplings in the time of Julius Caesar, and a large dragon-tree may live five thousand years. Moreover, wild life manifests few signs of senility. This trait seems reserved for man, and animals in captivity. Large animals seem to live a long time, small ones a short time. But size is not a sign of longevity, for a toad may live as long as a horse. There seems to be a rough-and-ready relationship between the length of life and growth period; animals which mature slowly often live long. Again, active creatures, worker bees for instance, seem to live short lives proportional to their intensity, while the sluggish or easy-going wear well.

It is less easy to find valid reasons for this ageing. It may be, as Weismann has suggested, that death is an adaptation for life; that, in the course of ages, those creatures whose life-span best meets the requirements of their environment, are selected for sur-



[n.d. wood

THE SPAN OF LIFE (IV.)

The huge sequoia trees of California are an example of organisms with a very long life, some of them being two thousand years old.

paration for a full life and a happy death in old age. In man, however, natural death is nearly always the result of an accumulation of physiological debts. Arrears of repairs are being piled up; hard-working organs, like heart and brain, wear out, and have lost the power of renovation. The dread of old age is due, not so much to fear of death, as to loss of bodily faculties and their diminished co-ordination. A "stroke" in the aged means the bursting of a worn-out artery in the brain. The bones become light and brittle, and a fall is apt to lead to fatal results.

It has been definitely shown that longevity or duration of life is a hereditary character.

vival. Accordingly, the traditional three-score years and ten is a response made by man to his surroundings, and is as much a characteristic of the species as any of his other qualities. This response is as open to environmental or educative influences as muscular development or pigmentation. Metschnikoff, the Russian physiologist, urged us to contemplate the maladjustment of man to his civilised surroundings, and argued that man dies from self-poisoning, the poisons being released by bacteria in his unwieldy food canal. Simpler living and food likely to stimulate the phagocytes (or germ-eating white corpuscles of the blood) would prolong his life and give him energetic old age.

Healthy living is clearly the best pre-

Such a characteristic is probably allied to what may be vaguely described as "a strong constitution," an inherent robustness which offers resistance to all the factors of ageing. The most permanent way, therefore, to increase the average age of a nation is to contrive that long-lived healthy stocks have more children than the weakly stocks. Obviously, nature provides that this principle obtains in natural communities, but man shelters the defective, and the unhealthy reproduce in the security of civilisation.

It is not often that man dies from too thronged a life—nevertheless he has lost the instinct for resting and cannot recognise the early danger-signals of fatigue. Hibernating animals can recuperate, but hibernation would be difficult in modern economic

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conditions. It is easier to make time to spring clean and overhaul one's house than to subject one's body to the same exercise. Of course, work can become a habit broken with difficulty. How often do we find that a man dreads to retire for the simple reason that retirement is so often followed by death. No wonder professors have preferred to prolong their lives by dying in their chairs !

• REGENERATION AND REPAIR

• In recent years very important contributions to the problems of old age have been made by the study of regeneration processes. From the observation and experimental imitation of regeneration and rejuvenation processes in nature, there has grown up the science of tissue culture, perhaps one of the most fertile lines of research at the present time. We are apt to look with wonder at the power which lower animals and plants possess of regenerating lost parts, chiefly because man, lacking this power, looks enviously upon it as a method apparently designed to prolong life. Yet a little reflection will show that the centralised control, which in man makes the regrowth of an amputated head or limb impossible, is more wonderful than the lack of specialisation which permits regeneration, but inhibits life on a high plane. A living sponge may be minced and strained through muslin, and the pieces will reform sponges; a flat-worm, cut in half, will regrow appropriate ends; a newt or crab can grow a new limb but not another head.

As we ascend the scale of animal life, the power becomes restricted to early stages in the life of the organism. Damages

in embryonic life can often be made good, but the adult creature loses this useful habit. Many striking experiments have been devised to test this power of youthful elasticity. A newt's egg, tied by a thread, to constrict it into two parts, will give rise to two normal newts. An analogous process probably accounts for the appearance of human identical twins. It is well known that human twins may be of two kinds: twins of the same or opposite sexes, who are not more alike than other brothers and sisters, and *identical twins*, always of the same sex, who are so alike that great confusion is caused by their physical and mental resemblance.



[After one hour]

SEEKING THE ELIXIR OF LIFE

Is death inevitable? Alchemists in the Middle Ages spent their lives searching for the magic fluid which was to conquer death. A new field for investigation has now been opened by the experiments of Steinach and Voronoff.

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Identical twins are derived from a single fertilised egg by some physiological accident not unlike the thread-tying in the newt experiment. Clearly, at the early stage when this "budding" takes place, there must be almost unlimited capacity for reorganisation. "Budded" twins of this kind are not uncommon in other species of animals.

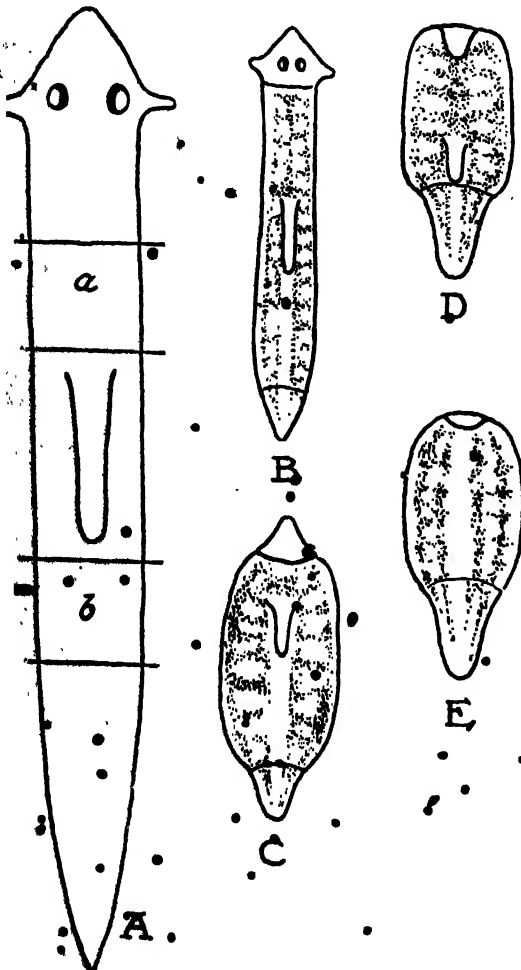
In the vegetable kingdom also, grafting experiments show that an intimate union can be forced upon two plants belonging

to different species. In fact, a graft hybrid, which may have some economic significance in the future, has been produced in France, bearing potatoes below and tomatoes above.

Experiments on animals have shown that it is possible to remove a dog's kidney, and, after subjecting it to a lengthy washing outside the body, to graft it back again so that its normal functioning is unimpaired. The ovaries of a pure white guinea-pig were removed, and in their place ovaries from a pure black female were grafted. After she was mated with a white male, a litter of healthy young were born, all of them black. Not only did this experiment show the possibilities of grafting, but it was an arresting proof that the germ-plasm within the eggs of the ovaries was the determining factor in heredity. The white body of the female had no effect in modifying the dominant factor for black coat colour contained in the grafted eggs.

Encouraged by these experiments on animals, surgeons not unnaturally wished to test the effects of grafting on their fellowmen. *Plastic surgery* has been the result. It has not only shown the marvels which can be achieved by skilful technique, but also revealed the length to which Nature will go, if her ways are studied and her powers encouraged. Fingers have been sacrificed for the sake of noses; skin from the leg of one person has been sewn on the face of another; glands from sheep or oxen have been implanted in man. The result has been, now failure, now success; the truth being that the experiments are in the nature of empirical guesses. Too little is known of the nature of cell division and cell differentiation, of the definite physiological adjustments and chemical reactions which go on in cell communities, making for life or death in cells, in tissues, in organs, and in the body as a whole. In other words, we do not know enough biology to be able to experiment with predictable results.

These biological questionings, which are fundamental to most problems of health and



[*"Individuality in Organisms," C. M. Child (University of Chicago Press)*
NEW HEADS FOR OLD

Planaria (unsegmented worms), being simple in structure, can recover their normal form after mutilation. Either (a) or (b) pieces may grow into a normal worm (3). In adverse conditions a rudimentary head or no head at all is formed (C, D, and E). With more complicated creatures, repair takes the place of regeneration.

. BIOLOGY AND HEALTH

healing, are those with which.

tissue-culture.

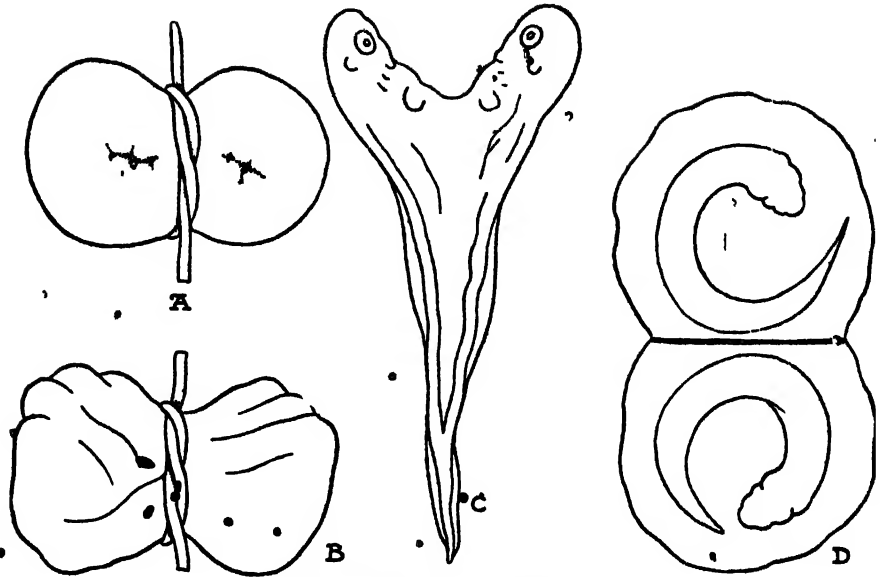
as chiefly concerned.

Tissue-culture is the growth of animal cells and tissues under artificial conditions outside the body.

In this way, conditions affecting growth can be intimately studied by a direct microscopical observation, by microdissection, by chemical analysis, and by an investigation of the changes induced by modifications in the environment, by the use of X-rays, for instance, or food changes. The work is associated with the names of Loeb, Carrel, Burrows, Harrison, and an increasing host of disciples.

It has been found possible to cultivate adult tissues of many animals, not only by allowing the tissues to grow under suitable temperature conditions in preparations of their own body fluids, blood plasma, lymph, or embryonic juices, but also in purely artificial solutions. The cells of the cultures rapidly grow and divide, and after transplantation into fresh media will go on growing indefinitely; tissues have been kept alive for twenty years, far longer than the life of the animal from which they were originally taken.

Here, then, is one approach to the problem of old age. Cells, when separated from the restraining or "repressing" influence of body interests, will live for ever. Moreover, once separated from the body, these cells in cultures return to a primitive, unspecialised, embryonic condition, losing the specialisation which their function in heart, or



TWO NEWTS FROM ONE EGG

By tying a thread round the young egg of a newt it can be constricted into two parts (A and B), and will give rise to two normal newts instead of one (D). C shows the imperfect separation of the two young newts. Identical twins in human beings originate by some such "accident"

liver, or skin had imposed upon them. But take these cells and carefully regraft them back again into the same kind of animal from which they are taken; then once more the burden of the special structure is reimposed; they grow for awhile but ultimately die.

If one were justified in using the term "cell-memory," here would be an appropriate situation in which to apply it. Few cells apparently do not "forget" their destiny, and a return to normal conditions recalls them to their duty.

Work on tissue-culture is laborious and requires long periods of patient waiting for cells to divide, which they do on the average only once in every twenty-four hours. An ingenious method has been devised whereby a series of photographs are automatically taken at small intervals of time, and from this a cinematograph film can be produced, and the life-history of a single cell condensed, as it were, from days into minutes: altogether a very promising field of investigation.

Experiments in tissue-culture, originally the concern of pure science, have been applied to the study of cancer. The prob-

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lem or cancer is a cell problem. In cancer, cells grow at an abnormal rate; they get out of control of the body as a whole, and their excessive multiplication closes vital passages, presses upon vital organs, and sets up toxic conditions in other parts of the body. Moreover, some cancer cells, as they increase in number, become de-differentiated, just like healthy cells in tissue-culture. Cancer cells can be grown in artificial media also, and their reaction to radium, X-rays, poisons, temperature changes, etc., carefully studied. Much light is being thrown on the habits of cancer cells, particularly on their nutritional idiosyncrasies.

In the thrifless way in which they use sugar, cancer cells resemble embryonic cells, and, since feeding, after all, is living, here may be a valuable clue to the nature of life in cancer cells.

This is one of the avenues along which ap-

proach may be made towards the discovery of the causes of cancer. It is a promising avenue, though not the only one.

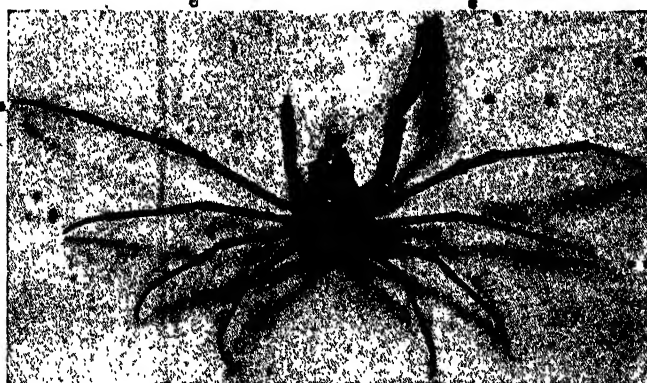
ANIMAL BEHAVIOUR

The most characteristic, least understood, supremely significant property of living things is their so-called "mentality" or behaviour—that is, the power which all living things possess of responding to stimuli. It would be well if the word "behaviour" could be used in many instances where the use of the word "mind" merely creates confusion. Mind can best be appreciated through behaviour; we can know living things only by the way in which they respond. Moreover, the habit of contrasting "mind" and "body" clouds the issue, and

makes a detached understanding of mind more difficult than ever. If animal behaviour, culminating in human mentality, is ever to be understood, we must proceed on the conviction that behind it is a protoplasmic system at work—a mechanism of cells.

In man, behaviour cannot be predicted with certainty. Some men will do one thing in a given situation; others will react quite differently; men and women are almost sure to give different responses. It is clear that we have not yet learned the laws governing human behaviour, for, when laws are known with certainty, accurate predictions can be made. But, in more

lowly creatures, behaviour can often be forecasted with a high degree of precision, and it is by studying the reactions of the humble amoeba, anemone, or insect that much has been learned of the nature of behaviour. He is also a psychologist who



[E. Slep

CRAB REGROWING A CLAW

A crab or newt can repair damage by growing a new limb, but it cannot grow another head.

watches the amoeba exploring his little universe, or the spider catching his fly.

Behaviour implies response to a stimulus. There must be something to receive the stimulus and something to conduct it to a place where response can be made. There is, in other words, adjustment to environment, adjustment, moreover, which generally implies an attempt at improvement by the individual. Thus most responses appear to be purposive. Purposiveness, however, does not necessarily connote consciousness. The amoeba appears purposeful when it approaches a particular species of green alga and ingests it. But it would be making far too great an assumption to credit the amoeba with a deliberate consciousness of the results of its action. A more simple

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explanation, in terms of physics and chemistry, may perhaps give us a complete reply.

In acquiring a perspective of human behaviour, it is useful for us to draw a parallel between the development of "mind" in man from the fertilised egg-cell to the adult individual and the evolution of

behaviour from amoeba to man. Since mind cannot come from outside, we must believe that the almost infinite potentialities of man's reasoning powers reside undeveloped in the fertilised ovum. A complicated nervous system, with all the apparatus of various sense organs, has come from a single nerveless cell. But that single cell possessed inherited potentialities for superior, average, or low-grade mentality according to the nature of the sex-cells whose union produced it. These latent potentialities can only be realised as the ovum grows, and, by growing, "behaves" in a relatively simple way—simple, that is to say, compared with the variety of performance in an adult. The kind of behaviour in which the developing egg specialises is response to chemical and physical stimuli—absorption of food from the mother resulting in cell multiplication, mechanical adjustments to temperature, and pressure in the uterus.

There is at present no reason to

suppose that a developing embryo can respond to mental stimuli of a specific kind—a belief in maternal impressions is, on the whole, discredited. Development proceeds, and, when the child is born, we say it has a mind. When does this mind arise? Is it the phenomenon of separate existence which confers the distinction, or the length

of time during which growth has been going on? The mind of a seven months' child is not destined on account of its prematurity to be less able or vigorous than the mind of a full-term child. The fact is that there is no point when we can definitely affirm that mind is, where before it was not. The embryo and the new-born babe live under different conditions. A limited internal environment becomes a limitless external one. The type of reaction changes accordingly, and the faculties of thinking, willing, and trying become more and more important.



IDENTICAL TWINS

Identical twins are always of the same sex, and are so alike that great confusion is caused by their physical and mental resemblance.

Now this picture of the development of mind from ovum to baby, from child to adult, is true also of the evolution of mind in the history of the race. Behaviour which is fairly simple and predictable, passes through infinite stages to behaviour which is highly intelligent, and therefore, paradoxical as it may sound, unpredictable. Nor is it possible to select some group of animals and say "here is mind." There is

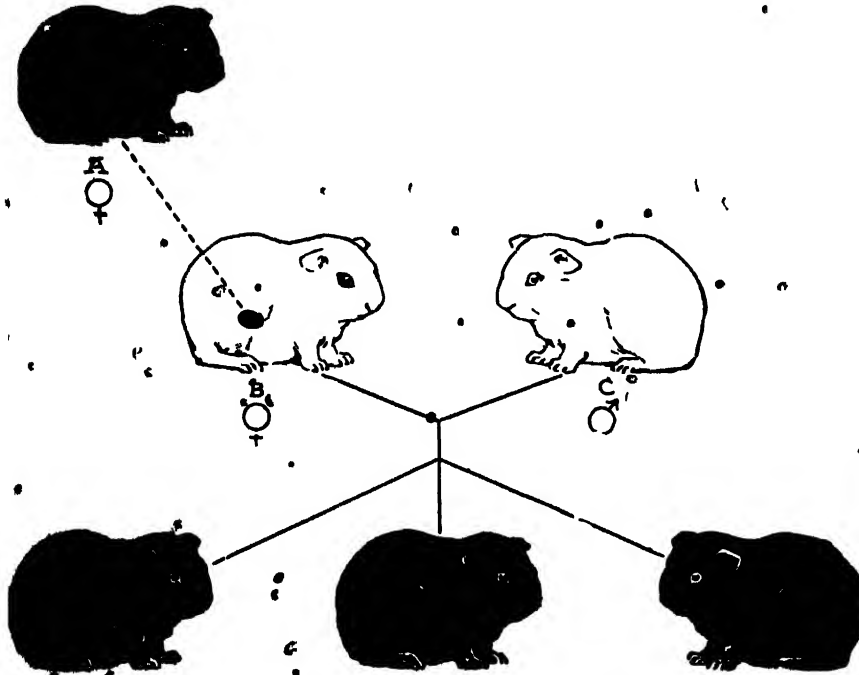
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an evolution from simple responses (tropisms) to light, gravity, temperature, water, food, etc., which manifest themselves, without a highly organised nervous apparatus, through the infinite gradations of reflex actions and instinctive behaviour, to the still more diverse manifestations of intelligent conduct. From the power to perceive follows the power to conceive. Man alone, apparently, reigns supreme in a land of conceptual

or the retina of his eye; simple reflex actions in heart or eyelid; "conditioned" reflexes in mouth-watering or typewriting; "instinctive" likes and dislikes; and, finally, rational conduct. That is not to say that man is a rational animal. He tries to be, but, more often, he acts instinctively, and invents good reasons for his actions afterwards. Nor does it deny that the various kinds of behaviour are interdependent.

Cheerful conversation aids the digestion, and fresh air begets sound judgment. But man differs from most other animals in his educability; he can store experiences and profit by them if he chooses—a more economical procedure than the wasteful method of trial and error.

Human behaviour is based on a nervous system of immense complexity. It is not necessary, however, to imagine that a highly organised nervous system is essential to energetic and forceful action, particularly when that response



THE DETERMINING FACTOR IN HEREDITY

Persistence of heredity in spite of change of environment is well shown by this experiment. B is a pure white female guinea-pig, C a pure white male. B's ovary was removed, and its place taken by the ovary from a pure black female, A. All the offspring of the cross B and C are black, because, although both parents are white, B contains only "black" eggs from A, and black is dominant over white. Thus the germ-plasm within the eggs of the ovaries is the determining factor.

inference, which is the basis of rational conduct, or the faculty of experimenting with general ideas. The exhibition of intelligence in animals, other than man, must be looked upon with suspicion. An apparently intelligent action in a dog may simply be the result of experimentation with instincts, or the conditioning of reflexes.

Man, however, displays the whole range of behaviour complexes—simple chemical changes in the cells of his intestinal tract,

involves locomotion. There are lowly animals which attain considerable speed and accuracy of movement without a centralised nervous system. Movement is one of the most widely spread responses to a great variety of stimuli. But it would be a safe thing to assert that very little *psychical* life could be experienced without some degree of centralisation. There is an experiment of Professor G. H. Parker which demonstrates very clearly the value of centralisation. He offered a tentacle on one side of a sea anemone, a tiny piece of

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SIMPLE RESPONSE (TROPISM) IN A PLANT

Roots grow downwards under the stimulus of gravity and light. Shoots respond to the same stimuli by growing upwards. It does not matter if the seed is planted upside-down. The turning, however, is brought about by growth and not by contractions, as in the muscles of animals.

meat, which it grasped and swept into its mouth. Then he offered the same tentacle a piece of blotting-paper, dipped in beef-tea. This also was ingested. True and artificial foods were given alternatively for some time, and the tentacle accepted both. After about ten times, however, the blotting-paper was rejected, and the meat only taken in. When the experiment is repeated with a tentacle on the *other* side of the anemone's mouth, meat and blotting-paper are both accepted without discrimination. There has been no profiting by experience, for there is no central brain to which reference can be made for past experience.

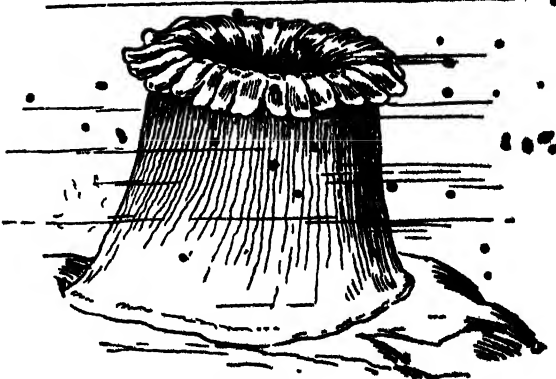
Animals have been divided into "big-brained" and "little-brained." Bees, ants, and wasps are little-brained, instinctive animals, whose elaborate activities are, in fact, mere routine, a long chain of reflex

actions. Horses, dogs, apes, and men are equipped at birth with few of these inborn capacities for doing skilful things. They have to learn, and are equipped with a nervous organisation enabling them to learn. The highest types of both big-brained and little-brained animals are social. Birds and mammals are gregarious, and the highest expression of instinctive behaviour is to be seen in the rigidly organised communities of bees and ants. Is sociality, then, an index of highly developed types of behaviour, whether instinctive or rational? A method of communicating by some kind of language seems an important ingredient of social life, and, in man, has been largely instrumental in perfecting social environment, which is the most important feature in man's evolution at the present time.

It is now more possible to discuss with a truer perspective the relationships of mind and body. Both mind and body

Bodily Changes in Emotion are aspects of the same thing—life which is founded in protoplasm. Mind cannot exist without a body, nor a body live without behaving. Thus it is less difficult to understand the effect of mind over matter, for example, in the practice of Couéism, or of body over mind, as in the irritating effect of a badly digested meal, or the stimulating effect of fresh air or alcohol.

One aspect of the problem may be mentioned here—the changes in the body



SEA-ANEMONE

The subject of Professor G. H. Parker's experiments which show clearly the value of a central brain to which reference can be made for past experiences.



INSTINCT OR REASON?

A police dog picks out the "criminal" from a group of men. The apparent intelligence shown by dogs must be looked upon with suspicion; it may be simply the effect of trained instinct.

(Central Press)

associated with the emotions. It is well known that the emotions of fear or anger, pain or hunger, are accompanied by definite changes in the body. The expressions "horror-stricken," "sick with disgust," "paralysed with fear," have a true physical basis. Fear or disgust will inhibit the ordinary work of digestion; the mouth will become parched; intestinal movements are suspended; gastric juices are not poured out; and a sensation of sickness is felt; sometimes actual vomiting occurs. Fear may cause trembling, panting, sweating, hair-raising; there may be an increase in the heart-beat; the pupils of the eyes may be dilated. In danger or in anger extraordinary feats of endurance or strength are performed which in normal times would have been deemed impossible. How are these changes produced in the body? A mechanism has been revealed by Professor C. B. Cannon, which seems to offer a convincing explanation of these phenomena. He has shown that, in danger, for instance, the aroused instinct of self-preservation

sends messages by means of the sympathetic nervous system to the adrenal glands which is thereby stimulated to pour an increasing amount of its hormone adrenalin into the blood. Adrenalin, circulating in the blood stream, causes energy to be diverted towards those parts of the body likely to be utilised in making an effective response. Thus blood is diverted from the stomach, intestines, spleen, kidney, to the brain, lungs, and muscles. The

smooth muscles of the air-sacs in the lungs are relaxed, thus facilitating the exchange of oxygen and carbon-dioxide. Sugar is released from the liver, to be burnt as fuel in the muscles. The sweat-glands are opened; the coagulability of the blood is increased and thus the possibility of bleeding to death from a wound is lessened. In other words, adrenalin makes men brave, or enables them to make an effective flight from danger. Thus we see that the excitement of an instinct, acting through the sympathetic nervous system, by means of the chemical substance adrenalin, originates emotion and produces important changes in bodily behaviour.

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